Economic Assessment for the Proposed Loadings-Based Listing of Non-Wastewaters from the Production of Selected Organic Dyes, Pigments, and Food, Drug, and Cosmetic Colorants

Final Report

Economics, Methods, and Risk Analysis Division
Office of Solid Waste
U.S. Environmental Protection Agency

November 2003

ACKNOWLEDGMENTS

The Agency recognizes DPRA Incorporated (E-1500 First National Bank Building 332 Minnesota Street, St. Paul, Minnesota 55101) for the overall organization and development of this report. DPRA developed the methodology, database, and analytical model that allowed for the comprehensive analyses of the regulatory scenarios presented in this report. Lyn D. Luben, Gary Ballard, and Barnes Johnson, all of the U.S. Environmental Protection Agency, Office of Solid Waste, provided guidance and review.

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

The Agency is required to make an initial determination if any regulatory action may constitute a significant regulatory action. Based on the findings presented in this report, we believe that this regulatory action, as proposed, does not constitute an economically significant regulatory action as defined under Section 3(f)(1) of Executive Order 12866. However, this rule may be considered significant, as defined under Section 3(f)(4) of this Order due to novel policy or legal issues. For example, the proposed rulemaking involves a unique load-based risk approach. This approach has not been proposed throughout the history of OSW's hazardous waste identification program.

This Economic Assessment (EA) was conducted to determine the potential impacts of the Agency's proposal to list as hazardous selected waste solids generated by the organic dye, pigment, and food, drug and cosmetic (FD&C) colorant industries, as well as to evaluate alternatives to the chosen approach. The analysis was conducted per the requirements of Executive Order 12866 (58 FR 51735, October 4, 1993) as amended by Executive Order 13258 (68 FR 9385, February 28, 2002), which requires that regulatory agencies evaluate whether a new regulation potentially constitutes a significant regulatory action.

This assessment presents an Economic Assessment (EA) corresponding to the proposed rule to list organic dye, pigment, and FD&C manufacturing nonwastewaters (K181). For the purposes of the K181 listing, dyes and/or pigments production is defined to include manufacture of the following product classes: dyes, pigments, or FDA certified colors that are classified as azo, triarylmethane, or anthraquinone classes. Azo products include azo, monoazo, diazo, triazo, polyazo, azoic, benzidine, and pyrazolone products. Anthraquinone products include anthraquinone and perylene products. Triarylmethane products include both triarylmethane and triphenylmethane products. Organic dye, pigment or FD&C manufacturing nonwastewaters include but are not limited to: spent catalysts, spent adsorbents, equipment cleaning sludge, product standardization filter cake, filter aid, dust collector fines, recovery still bottoms, and wastewater treatment sludge. The proposed listed waste generated by the organic dye, pigment, and FD&C industries is:

> K181--Nonwastewaters from the production of dyes and/or pigments(including nonwastewaters commingled at the point of generation with nonwastewaters from other processes) that, at the point of generation, contain mass loadings of the following constituents: Aniline, o-Anisidine, 4-Chloroaniline, p-Cresidine, 2,4-Dimethylaniline, 1,2-Phenylenediamine, 1,3-Phenylenediamine, and Toluene-2,4-diamine that are equal to or greater than the acceptable conditional mass-loading levels, as determined on a calendar year basis. These wastes would not be hazardous if: (i) the nonwastewaters do not contain annual mass loadings of the following constituent: toluene-2,4-diamine, that are equal to or greater than the corresponding non-conditional mass-loading level; and (ii) the nonwastewaters are disposed in a Subtitle D landfill cell subject to the design criteria in §258.40 or in a Subtitle C landfill cell subject to either §264.301 or §265.301. This listing does not apply to wastes that are otherwise identified as hazardous under §§261.21-24 and 261.31-33 at the point of generation. Also, the listing does not apply to wastes generated before any annual mass loading is met.

In addition to the impacts on the dye, pigment and FD&C industries, the proposed waste listing also result in impacts on other industries (i.e.,non-dye, pigment and FD&C industries). These include non dye and pigment facilities that generate hazardous wastes containing one or more of the new constituents being added to the list of constituents serving as the basis for classifying wastes as hazardous (40 CFR Part 261 Appendix VIII) and land disposal facilities which have disposed wastes considered in this rulemaking. Facilities in other impacted industries will have to conduct additional sampling for these constituents and may need to treat wastes to UTS levels if current treatment methods are not already sufficient. Also, because of the proposed listing, leachate from the land disposal facilities which have disposed of the wastes considered in this rulemaking may be hazardous under the Derived-from Rule. When the leachate from this wastes mixes with leachate from other wastes disposed in these landfills the entire leachate quantity may be considered hazardous under the Mixture Rule.

We have identified a total of 37 organic dye, pigment, and FD&C facilities in operation in the U.S., which are owned by 29 different companies that are believed to be generating wastes of concern. This industry segmentation includes all facilities identified in Standard Industrial Classification (SIC) 2865, and under the North American Industrial Classification System (NAICS) code 325132. We estimate that 48 percent of all organic dye, pigment, and FD&C companies in the U.S. are small according to the Small Business Administration (SBA) definition of fewer than 750 employees based on corporate level data[1]. A number of these companies are very small, with fewer than 50 total full-time employees. A total of 15, or about 52 percent of the 29 companies potentially subject to rule requirements are determined to be small businesses.

An analysis of Toxics Release Inventory (TRI), National Hazardous Waste Constituent Survey (NHWCS), Colour Index, 2001 SRI Directory of Chemical Producers, public comments on prior proposed dye and pigment listings, and non-confidential business information (CBI) 3007 RCRA Questionnaire data indicate that 16 of the 37 facilities may generate waste solids containing one or more of the eight constituents of concern.

Incremental costs to comply with new management, administrative, and sampling and analysis requirements for the proposed K181 listing range from \$0.6 to \$3.4 million per year depending upon the estimated total suspended solids concentration in the wastewater. This estimate includes only the <u>16 facilities</u> identified as potentially having wastes containing constituents of concern. Furthermore, this estimate assumes that mass-loading listing levels are exceeded for toluene-2,4-diamine for the facilities identified as having wastes containing this constituent.[2]

---

1 *Table of Small Business Size Standards - Matched to North American Industrial Classification System (NAICS) Codes*, Revised May 5, 2003, U.S. Small Business Administration (SBA)

2 Under a "Standard Listings Approach" where the waste will need to meet Universal Treatment Standards (i.e., combustion) and Land Disposal Restriction regulations, incremental compliance costs range from \$9.4 to \$15.9 million per year for the 16 facilities with wastes containing constituents of concern.

Under a worse case scenario, incremental compliance costs were found to range from $1.4 to $4.3 million per year if all 37 facilities would have wastes containing constituents of concern, and if the nonconditional mass-loading listing levels are exceeded for toluene-2,4-diamine for the facilities identified as having waste containing this constituent.[3]

Industry-average percent of annual *corporate* sales impacts for companies with known wastes containing CoCs, a total of 14 companies (16 facilities), were found to range between 0.02 percent assuming a low nonwastewater generation rate and 0.04 percent assuming a high nonwastewater generation rate and facilities exceed the mass-loading listing levels. Assuming all 29 companies generate waste with CoCs, industry-average annual corporate sales impacts are only slightly higher at 0.02 percent assuming a low nonwastewater generation rate and 0.05 percent assuming a high nonwastewater generation rate and facilities exceed the mass-loading listing levels. Impacts for individual companies are not expected to exceed one percent of corporate sales under either assumption with the loading-based listing.[4]

Non-dye, pigment and FD&C facilities (referred to as "expanded scope facilities") may be indirectly impacted if they generate hazardous wastes containing one or more of three toxic constituents of concern (o-anisidine, p-cresidine, and 2,4-dimethylaniline) being added to the list of constituents serving as the basis for classifying wastes as hazardous (40 CFR 261, Appendix VIII).[5] A total of 13 expanded scope facilities were identified, with one identified as a small business. All of the expanded scope facilities identified are assumed to generate wastes containing at least one of the constituents of concern (o-anisidine, p-cresidine, and 2,4-dimethylaniline) that will be added to Appendix VIII. No incremental compliance management costs were identified or assumed for the expanded scope businesses due to existing treatment

---

3 Under a "Standard Listings Approach" where the waste would need to meet Universal Treatment Standards (i.e., combustion) and Land Disposal Restriction regulations, incremental compliance costs would range from $17.0 to $26.3 million per year if all 37 facilities are impacted.

4 Industry-average percent of annual corporate sales impacts for a "Standard Listing Approach" is estimated to range from 0.21 percent for only those companies generating wastes containing CoCs and generating low amounts of waste, to 0.72 percent assuming all 29 companies generate wastes containing CoCs and generate high amounts of waste. One company exceeds 3.0 percent (5.6 percent) of annual corporate sales using the low generation estimate. Two companies exceed 3.0 percent of annual corporate sales (with a high of nearly 9.6 percent) using the high generation estimate.

5 Three constituents (aniline, 4-chloroaniline, and toluene-2,4-diamine) are already on the 40 CFR Part 261 Appendix VIII list of constituents. Expanded scope facilities are already sampling for and treating these constituents to be in compliance with current regulations. Phenylendiamine is currently on the Appendix VIII list under the CAS number for it's mixed isomers 25265-76-3. The mixed isomer listing includes the ortho, meta, and para versions of this chemical combined.

patterns for their nonwastewater organic wastes. Incremental sampling and analysis costs only are anticipated for these facilities. Percent of annual corporate sales impacts range from 0.00001 percent to 0.08 percent, with an average of 0.01 percent.

In addition to the costs presented above, incremental costs may be incurred by the landfill industry for the Agency's proposed approach (the Clean Water Act Exemption with two-year impoundment replacement deferral). Cost impacts are expected to be less than those estimated in the proposed paint manufacturing hazardous waste listings given the dye, pigment, and FD&C industries generate less waste. For the proposed paint waste listings incremental costs expected to be incurred by the landfill industry were estimated to be approximately $300,000 to $400,000 annually for the Agency's proposed approach.

The proposed rule is intended to reduce the potential for environmental releases of hazardous wastes. Depending on current and future exposure patterns, the rule, as proposed, is projected to yield benefits in terms of reductions in health risks due to stricter controls on the management of this waste. The Agency has not monetized or quantitatively estimated the human health or environmental benefits, but anticipates that such benefits would be less than $100 million per year. Additional data are necessary to make a firm determination as to whether there will be quantifiable net benefits (i.e., benefits exceeding costs) from the proposed rule.

We also examined possible impacts associated with relevant legislation other than RCRA, and various Executive Orders. These include: the Unfunded Mandates Reform Act (UMRA), Executive Order 13132, (Federalism), Executive Order 13045 (Protection of Children from Environmental Health Risks and Safety Risks), Executive Order 12898 (Environmental Justice), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), Executive Order 13211 (Energy Effects), Executive Order 13166 (Limited English Proficiency), and Regulatory Takings. The proposed rule is not expected to result in significant economic impacts, as defined under UMRA, or have impacts associated with any of the executive orders mentioned above.

2.0 INTRODUCTION

This report presents an Economic Assessment (EA) corresponding to the proposed rule to list organic dye, pigment, and FD&C manufacturing nonwastewaters (K181). For the purposes of the K181 listing, dyes and/or pigments production is defined to include manufacture of the following product classes: dyes, pigments, or FDA certified colors that are classified as azo, triarylmethane, or anthraquinone classes. Azo products include azo, monoazo, diazo, triazo, polyazo, azoic, benzidine, and pyrazolone products. Anthraquinone products include anthraquinone and perylene products. Triarylmethane products include both triarylmethane and triphenylmethane products. Organic dye, pigment or FD&C manufacturing nonwastewaters include but are not limited to: spent catalysts, spent adsorbents, equipment cleaning sludge, product standardization filter cake, filter aid, dust collector fines, recovery still bottoms, and wastewater treatment sludge. K181 waste is defined as:

> Nonwastewaters from the production of dyes and/or pigments(including nonwastewaters commingled at the point of generation with nonwastewaters from other processes) that, at the point of generation, contain mass loadings of the following constituents: Aniline, o-Anisidine, 4-Chloroaniline, p-Cresidine, 2,4-Dimethylaniline, 1,2-Phenylenediamine, 1,3-Phenylenediamine, and Toluene-2,4-diamine that are equal to or greater than the acceptable conditional mass-loading levels, as determined on a calendar year basis. These wastes would not be hazardous if: (i) the nonwastewaters do not contain annual mass loadings of the following constituent: toluene-2,4-diamine, that are equal to or greater than the corresponding non-conditional mass-loading level; and (ii) the nonwastewaters are disposed in a Subtitle D landfill cell subject to the design criteria in §258.40 or in a Subtitle C landfill cell subject to either §264.301 or §265.301. This listing does not apply to wastes that are otherwise identified as hazardous under §§261.21-24 and 261.31-33 at the point of generation. Also, the listing does not apply to wastes generated before any annual mass loading is met.

EPA is proposing to list nonwastewaters from dye, pigment, and FD&C production as hazardous if they contain any of the constituents identified in Table 2-1 or 2-2 at a mass loading rate greater than or equal to the hazardous level set for that constituent.

Table 2-1. Conditional K181 Mass-Loading Listing Levels		
Constituent	**Chemical Abstracts No.**	**Mass Level (kg/yr)**
Aniline	62-53-3	9,300
o-Anisidine	90-04-0	110
4-Chloroaniline	106-47-8	4,800
p-Cresidine	120-71-8	660
2,4-Dimethylaniline*	95-68-1	100
1,2-Phenylenediamine	95-54-5	710
1,3-Phenylenediamine	108-45-2	1,200
Toluene-2,4-diamine	95-80-7	0.99

* Synonyms include 2,4-xylidine and 1-amino-2,4-dimethylbenzene.
Note: These levels correspond to the K181 listing levels proposed to be added to 40 CFR 261.32(c)(1).

Table 2-2. Nonconditional K181 Mass-Loading Listing Levels		
Constituent	**Chemical Abstracts No.**	**Mass Level (kg/yr)**
Toluene-2,4-diamine	95-80-7	140

Note: This level correspond to the K181 listing levels proposed to be added to 40 CFR 261.32(c)(2).

Executive Order No. 12866 (58 FR 51735, October 4, 1993) as amended by Executive Order 13258 (68 FR 9385, February 28, 2002) requires that regulatory agencies determine whether a new regulation constitutes a significant regulatory action. A significant regulatory action is defined as an action likely to result in a rule that may:

Economic Significance:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;

Procedural Significance:

- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in Executive Order 12866.

This analysis is primarily designed to address the economic significance of the proposed rule. To accomplish this, EPA estimated the costs and potential economic impacts upon affected industries.

2.1 Background and Purpose of Rulemaking

In 1989, Environmental Defense (ED, formerly the Environmental Defense Fund), sued the Agency, in part, for failing to meet statutory deadlines of Section 3001(e)(2) of RCRA.[6] To resolve most of the issues of the case, ED and EPA entered into a consent decree which was approved by the court on June 18, 1991. The consent decree set out an extensive series of deadlines for promulgating RCRA rules and for completing certain studies and reports. The consent decree included deadlines for proposing and promulgating a final listing determination for wastes from the production of certain classes of dyes and pigments.

On December 22, 1994 (59 FR 66072), the Agency published the proposed action: *Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Dye and Pigment Industries; Hazardous Waste Listing Determination Policy; and CERCLA Hazardous Substance Designation and Reportable Quantities: Proposed Rules.* This action proposed listing, as hazardous, five wastes (proposed as K162 through K166) generated during the production of dyes and pigments due to evidence indicating unacceptable risks to human health and the environment resulting from existing management practices for these wastes. In the proposed rule, the Agency deferred action on three wastes.

On July 23, 1999 (64 FR 44444), EPA published a follow-up proposal: *Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Dye and Pigment Industries; Land Disposal Restrictions for Newly Identified Wastes; CERCLA Hazardous Substance Designation and Reportable Quantities: Proposed Rule.* This listing determination addressed the three deferred wastes, proposing to add two of these wastes (proposed as K167 and K168) to the list of hazardous wastes in 40 CFR 261.32. Unlike the 1994 proposed rule, the Agency included implementation conditions for the wastes proposed in the 1999 rule, such that

---

6 EDF v. Reilly; Civ. No. 89-0598 D.D.C.

the wastes would not be hazardous if they contained any of the constituents identified in the applicable list at a concentration greater than or equal to the risk-based concentration level proposed for that constituent.

Both proposals were supported by data from a questionnaire sent out to industry pursuant to RCRA section 3007. Some of the information submitted by some producers was claimed to be confidential business information (CBI). As a result of a consent order and a subsequent preliminary injunction entered in a case brought by some producers to prevent the disclosure of information claimed as CBI, EPA redacted some information from the preambles and background documents for these proposals. *Magruder Color Co., et al. v. EPA*, Civ. No.94-5768 (D.N.J.)

In 2002 EPA began work on a new proposal based on a non-traditional "loadings-based"listing for dye and pigment wastes. Under this approach, EPA does not need to use any data submitted by the plaintiffs in the *Magruder* litigation.

Under the most recent amendment to the ED Consent Decree, EPA must propose a listing determination for the three specified classes of dye and pigment production wastes on or before November 10, 2003 . EPA must make a final listing decision by February 16, 2003.

This analysis evaluates a new approach for listing of dye, pigment and FD&C nonwastewaters (wastewaters are not proposed for listing). The approach taken for this proposed listing is a load-based risk approach. In a load-based risk approach wastes are considered hazardous if they contain one or more of the specified constituents exceeding a mass loading (constituent concentration *times* quantity of the wastestream) standard. Those wastes exceeding the load-based standard would be required to meet land disposal restriction (LDR) treatment requirements (i.e., incineration) under what is referred to as the Standard Listing Approach. However, the Agency is proposing an alternative management approach, referred to as the Agency Preferred Approach, which allows the waste to be excluded from the listing if it is managed in a municipal waste landfill cell subject to the design criteria in §258.40, or in a Subtitle C landfill cell subject to either §264.301 or §265.301, and if it does not meet or exceed the alternative loading limit for one constituent (Toluene 2,4-diamine)

This analysis estimates how facilities in the dye, pigment and FD&C industries may be affected by the loadings-based risk approach for listing of nonwastewaters under two approaches: the Standard Listing Approach and the Agency Preferred Approach, as mentioned above. Estimates of the cost and economic impacts of the regulation are determined nationwide, and on both a facility-specific and company basis for these two listing approaches.

2.2 Need For Regulatory Action

While waste produced by facilities in the dyes, pigments, and FD&C industries are already regulated to a certain extent under federal regulations (e.g., inorganic pigment, characteristic, and solvent wastes), certain waste streams generated by these facilities are not regulated and pose both human health and ecological risks. Current disposal practices for nonwastewaters have the potential to pollute soil and water. To date, the market and other private sector institutions have failed to fully address pollution issues associated with nonwastewaters.

First, because individuals not responsible for the pollution bear the costs in human health and ecological damages, no direct incentive exists for dye, pigment, and FD&C facilities to incur the additional costs for implementing pollution control measures. In this case, the private industry costs of production do not fully reflect the human health and environmental costs of management of these wastes. This situation, referred to as "environmental externality," represents a type of market failure discussed in OMB's Guidelines.[7] A non-regulatory approach, such as educational outreach programs, would be largely ineffective because the people who are made aware of the potential health risks (e.g., those people living near landfills where these wastes are disposed) have limited ability to reduce exposure without incurring significant costs.

Second, the parties harmed by the pollution of soil and water can not feasibly obtain compensation from dye, pigment, and/or FD&C facilities through legal or other means due to the high transaction costs involved and the difficulty in establishing a causal relationship between the damage incurred and activity at the dye, pigment and/or FD&C facilities. Establishing a direct link between a specific facility and human health and other damages incurred may be especially difficult since under current practices many facilities dispose of wastes in landfills where it is co-mingled with many other wastes.

To internalize the environmental costs and to correct existing market distortions, government intervention is necessary. Therefore, EPA is proposing to list nonwastewaters from dye, pigment, and FD&C production as hazardous if they contain any of the constituents identified in Table 2-1 or 2-2 at a mass loading rate greater than or equal to the hazardous level set for that constituent.

Finally, this action is proposed under the authority of Sections 2002, 3001 (b)(1), 3001(e)(2), and 3007 of RCRA. Section 3001(e)(2) directs EPA to make a hazardous waste listing determination for "dyes and pigments."

---

[7] Office of Management and Budget (OMB). January 1996. *Economic Analysis of Federal Regulations Under Executive Order 12866*, 3-5.

2.3 Scope of Study and Data Sources

This study is an assessment of the potential impacts that will be borne by the dye, pigment, and FD&C industries for which the waste listing is being proposed and other industries that generate wastes containing the constituents with newly defined Universal Treatment Standards. Impacts to selected categories of the waste management industry are also examined. The dye, pigment, and FD&C industries produce literally hundreds of different products, typically in batch processes. Unfortunately, useful, unrestricted economic data for this industry are difficult to obtain. Primary data sources include the following (other sources are listed in the references in Section 8):

- The Chemical Economic Handbook published by SRI International,
- The U.S. International Trade Commission,
- EPA Toxics Release Inventory (TRI) database,
- EPA Hazardous Waste Report (Biennial Report) database,
- Dun and Bradstreet,
- Chemical Manufacturer and Product Database by ChemChannels.com, and
- Cornell University, Department of Environmental Health and Safety, Material Safety Data Sheets database.

2.4 Limitations of Analysis

Because of the need to rely on publicly available data, there are numerous analytical limitations related to several key issues. These limitations are briefly summarized below.

- This analysis relies, in part, on estimates of facility revenues for dye and pigment production which are derived from various sources. Estimates may not accurately reflect actual current revenues.

- This analysis does not capture all of the variables that may affect a generator's decisions about how to manage the proposed nonwastewaters.

- Limited publicly available data may have resulted in the underestimation or overestimation of potentially affected dye and pigment facilities identified with constituents of concern. If our sources did not identify all the constituents of concern used by all facilities, then we may have underestimated the number of affected facilities. On the other hand, we may have overestimated impacts if facilities do not (or no longer) use these chemicals, or if any constituents of concern present are below the mass loading limits.

- Data on nonwastewater generation are generally not available. We used a variety of sources to estimate waste quantities, including NPDES permit data, Office of Water data characterizing wastewater composition, generation and discharge rates for the organic chemical manufacturing industries, and other sources described more fully in section 4.3. Our methodology may not fully reflect current waste generation patterns and may result in uncertain cost estimates.

- Cost and economic impacts are based on total rather than incremental nonwastewater quantities due to the lack of facility specific data needed to determine loadings for constituents-of-concern. This limitation results in an overestimate of impacts.

2.5 Organization of Report

This report is divided into six sections. Section 3 presents a profile of the dyes, pigments, and FD&C industries. This includes available economic profile data, such as products manufactured, profiles of facilities, market structure, an assessment of the market value of industry shipments, and product imports and exports.

Section 4 presents waste generation and management estimates. This Section also includes nationwide unit and facility costs and prices used in the baseline and post-regulatory cost estimates. Section 5 documents the costs and economic impacts of the proposed listing, Section 6 presents a qualitative discussion of the potential benefits, and Section 7 presents a discussion of other administrative requirements (e.g., environmental justice, unfunded mandates, protection of children, etc.).

3.0 DYES AND PIGMENTS INDUSTRIES PROFILE

The organic dye, pigment and FD&C industries produce dyes and pigments for a wide variety of intermediate and end users including the automotive, textile, printing, plastics, food, and drug manufacturers. This chapter profiles the characteristics of the organic dye, pigment and FD&C industries.

Organic dye and pigment manufacturing industries are classified under the North American Industry Classification System (NAICS) 325132. Food, drug and cosmetics colorant manufacturers are included in several NAICS industries, including: 311942--Spice and Extract Manufacturing; 311930--Flavoring Syrup and Concentrate Manufacturing; and, 325199--All Other Basic Organic Chemical Manufacturing.

The U.S. market for organic dyes and pigments is forecasted to grow about 3 percent per year through 2005, rebounding from sluggish growth of only 0.6 percent from the 1995 through 2000 period. Much of the gains in market values are expected to result from a shift towards more expensive organic colorants.[8]

This chapter is made up of four individual sections: 1) organic dye industry overview, 2) organic pigment industry overview, 3) a brief overview of FD&C colorant manufacturers, and 4) an overview of the facilities that are expected to be impacted as the result of the proposed rulemaking.

3.1 Organic Dyes Industry Characteristics

Dyes are defined as "intensely colored or fluorescent organic substances only, which impart color to a substrate by selective absorption of light. Dyes are soluble and/or go through an application process that, at least temporarily, destroys any crystal structure of the color substances. Dyes are retained in the substrate by absorption, solution and mechanical retention or by ionic or covalent chemical bonds."[9]

This section presents an economic profile of the organic dyes industry which is classified under the North American Industry Classification System (NAICS) 3251321. The following subsections describe selected characteristics of the organic dye industry including products and processes, affected facilities, market structure, employment, and industry production and value.

---

8 Chemical Week. 7/25/01. "Pigments brighten; dyes fade."

9 "Chemical Economic Handbook Marketing Research Report - Dyes," SRI International, 2000.

3.1.1 Overview of Products and Processes

The Ecological and Toxicological Association of the Dyestuffs Manufacturing Industry (ETAD) defines dyes as "intensely colored or fluorescent organic substances which impart color to a substrate by selective absorption of light." When applied, dyes penetrate the substrate in a soluble form, after which they may or may not become insoluble. The structure of dyes is temporarily altered during the application process and colors are imparted only by selective absorption.[10]

Dyes are used to color fabrics, leather, paper, ink, lacquers, varnishes, plastics, cosmetics, and some food items. Several thousand individual dyes of various colors and types are manufactured. This large number is attributable to the many different types of materials to which dyes are applied and the different conditions of service for which dyes are required.[11]

Synthetic dyes are derived in whole or in part from cyclic intermediates. Approximately two-thirds of the dyes consumed in the United States are consumed by the textile industry to dye fabrics; about one-sixth are used for coloring paper; and the rest are used primarily in the production of organic pigments and in the dyeing of leather and plastics.[12]

Commercial dyes are sold in several physical forms including granular, powders, liquid solutions, and pastes. The dyes contain colorata concentrations ranging from approximately one to more than 98 percent.[13]

Organic dyes are classified in several ways including their chemical structure or class, general dye chemistry, and application process. Chemical structure classifications include azos, triarylmethanes, diphenylmethanes, anthraquinones, stilbenes, methines, polymethines, xanthenes, phthalocyanines, and sulfurs. Common application process classes include acid, basic, direct, reactive, disperse, vat, and solvent. Using general dye chemistry, textile dyes are grouped into 14 categories or classes: acid dyes, direct (substantive dyes), azoic dyes, disperse dyes, sulfur dyes, fiber reactive dyes, basic dyes, oxidation dyes, mordant (chrome) dyes,

---

[10] "Dyes and Dye Intermediates." Kirk-Othmer Encyclopedia of Chemical Technology, Fourth Edition. Volume 8. New York: John Wiley & Sons, Inc, 1993.

[11] "Chemical Economic Handbook Marketing Research Report - Dyes,", SRI International, 2000.

[12] "Synthetic Organic Chemicals United States Production and Sales, 1991", USITC Publication 2607, February 1993.

[13] "Chemical Economic Handbook Marketing Research Report - Dyes,", SRI International, 2000.

developed dyes, vat dyes, pigments, optical/fluorescent brighteners, and solvent dyes[14].

The processes for developing azo and triarylmethane dyes, along with their primary uses, and limitations, when applicable, are briefly described below.

Azo Dyes

Azo dyes are formed by a diazotization reaction, which involves forming a diazonium ion from an aromatic amine using nitrous acid. A typical azo dye manufacturing process may include the following steps: slurry of raw materials, pre-reaction of raw materials, diazotization reaction, coupling reaction, filtration, drying, milling, standardizing, packaging, and shipping. The first three steps, slurrying, pre-reaction, and the diazotization reaction, can occur in the same reaction vessel. In this vessel, raw materials, water, and ice (for temperature control) are added, and the solution is agitated. The coupling reaction is conducted under controlled pH. The product stream is pumped to a large plate and frame filter press where it is isolated and collected as filter press cake. The product filter press cake is transferred to containers and may be either sold in this wet form or further processed. Further processing includes drying and pulverizing into a fine powder.[15]

Azo dyes produce a range of colors with excellent fastness properties. Azos are used essentially for all organic dye applications including natural and synthetic substrates. Historically azo dyes have been one of the most important dyes, accounting for as much as 35 percent of total dye production in 1972, for example.[16] Azo dyes form the largest single class of synthetic dyes, and they include more than 1,000 individual products.[17]

---

14 S. V. Kulkarni, C. D. Blackwell, A. L. Blackard, C. W. Stackhouse, and M. W. Alexander, U.S. Environmental Protection Agency, Air and Energy Engineering Research Laboratory, "Project Summary Textile Dyes and Dyeing Equipment: Classification, Properties, and Environmental Aspects," EPA/600/S2-85/010, April 1985.

15 Austin, George T, *Shreve's Chemical Process Industries*, 5th edition, McGray-Hill Book Company, 1984; "Dye Manufacturing," Pollution Prevention Abatement Handbook, World Bank Group, effective July 1998, and "Pollution Prevention and Abatement Guidelines for Dye Manufacturing Industry," http://www.cleantechindia.com/bishhtml/2102.101.htm

16 USITC. 1974. Synthetic Organic Chemicals, U.S. Production and Sales.

17 ETAD. 12/15/1995. "Comments of the United States Dye Manufacturers Operating Committee of the Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers (ETAD)." EPA Docket DPLP-00027.

Triarylmethane Dyes

Chemically, triarylmethane dyes are derivatives of the colorless compounds triphenylmethane and diphenylnaphthylmethane. Primary, secondary or tertiary amino or hydroxyl groups in para positions to the methane carbon atom provide the color. Additional substituents present may include carboxyl, sulfonic acid or halogen groups. Possible hues include reds, violets, blues and greens. Several preparation methods exist for triarylmethane dyes. For example with the aldehyde method, the central carbon atom in the triarylmethane structure is derived from the aromatic aldehyde. Malachite green is prepared by reacting benzaldehyde with dimethylaniline in acidic conditions at 100˚C. The reaction is made alkaline and the excess dimethylaniline is removed. The resultant leuco base is oxidized and lead salt is precipitated. Acidification produces the dye, which can be isolated as a chloride oxalate or a zinc chloride double salt.[18]

Triarylmethane dyes possess brilliant hue and have high tinctorial strength. They are inexpensive and may be applied to a wide variety of substrates. However, they have poor fastness properties. They are used to color acrylic fibers, paper and inks.[19]

3.1.2 Profile of Industry Facilities - Organic Dyes

A 1997 census report[20], the most recent census data available, provides some limited information on the organic dye industry. In 1997, there reportedly were 37 establishments listed under NAICS Code 3251321, Synthetic Organic Dyes. An estimated 3,500 individuals were employed by the industry and total industry wages were approximately $160 million.[21]

3.1.3 Industry Production and Value

The data in Table 3-1, shows that from 1997 through 1999, annual dye production has fluctuated from approximately 178.0 to 183.5 thousand tons. Production is projected to increase to 185.5 thousand tons in 2005.

---

18 Ishikawa, Yosuke with Todd Esker and Andreas E. Leder. SRI International, The Chemical Economics Handbook, 2000. *CEH Marketing Research Report - Dyes.*

19 Ibid.

20 Synthetic Organic Dye and Pigment Manufacturing, Manufacturers-Industry Series, Census Bureau, Department of Commerce 1997.

21 Ibid.

Table 3-1. Total U.S. Production for Synthetic Organic Dyes	
Year	Production (thousands of U.S. tons)
1997	183.5 *
1998	178.0 *
1999	179.0 **
2003	183.5 **
2004	184.5 **
2005	185.5 **

* Source: Ishikawa, Yosuke with Todd Esker and Andreas E. Leder. SRI International, The Chemical Economics Handbook, 2000. CEH Marketing Research Report - Dyes.
** Estimated from: Ishikawa, Yosuke with Todd Esker and Andreas E. Leder. SRI International, The Chemical Economics Handbook, 2000. CEH Marketing Research Report - Dyes. (Supply and Demand by Region: United States, page 2. 1995 through 1998 annual average growth of 0.6 percent. Projected from 355.9 million pounds in 1998 base year.)

Table 3-2 shows the weighted prices for organic dyes from 1998 to 2002. From 1998 to 2002, the weighted average price for synthetic organic dyes steadily declined by 28 percent from $8,095 per ton to $5,870 per ton.

Table 3-2. Total U.S. Weighted Average Prices for Synthetic Organic Dyes	
Year	Price (Dollars/ton)
1998	8,095
1999	7,954
2000	7,119
2001	6,310
2002	5,870

Source: Based on USITC export price and quantity data for organic dyes included in HTS 320411 through 320416, and 320419.

Table 3-3 focuses on the distribution, production and sales by facility size for dyes, based on Census of Manufacturers data. The Census identified 37 dye facilities, plus an additional 32 facilities which manufactured dyes or pigments, or both which accounted for only 2.5 percent of total industry production.

Table 3-3. Dye Facility Size Distribution, Production and Sales*				
Employment Per Facility	Number of Facilities	Value of Shipments (Million Dollars)	Aggregate Estimated Production (1000 U.S. tons)	Average Sales/ Facility (Million Dollars)
1-19	8	32.3	5.0	$4.0
20-99	15	183.8	28.3	$12.3
>100	14	784.8	120.7	$56.1
Total	37	1000.9	154.0	$27.1

Source: Synthetic Organic Dye and Pigment Manufacturing, Manufacturers-Industry Series, Census Bureau, Department of Commerce 1997.
*Estimates derived from 1997 Census of Manufacturers for Synthetic Organic Dye and Pigment Manufacturing. Census only reports number of dye facilities and total value of dye shipments. Of the 112 facilities reported in the synthetic dyes and pigments industries, only 80 (37 dye and 43 pigment) were classified; the remaining 32 facilities were not specified by kind. These very small facilities accounted for approximately 2.5% of total industry shipments.

3.1.4 Domestic Industry Market and Trends

The late 1990's were difficult for the U.S. dye industry, primarily because of weakness in the textile industry, which accounts for 60 percent of U.S. dye consumption. Also contributing to decreases in textile dye consumption were increased imports of finished textile imports. Many countries in Asia, like China, India and Indonesia have significantly lower labor and environmental costs than the U.S. In addition, the global currency crisis in 1998-1999, which led Asian countries to increase exports, resulted in the sharp fall of dye and textile prices.[22]

In 2000, it was reported that U.S.-owned companies account for 25 percent of all U.S. based operations, while European-owned U.S. subsidiaries held the remaining 75 percent.[23] Currently, the majority of the U.S. dye business is controlled by European-owned companies in the U.S.

---

22 Ibid.

23 "Chemical Economic Handbook Marketing Research Report - Dyes", SRI International, 2000.

Due to declining prices, some U.S. synthetic organic dye manufacturing companies have been forced to cease operation at certain manufacturing plants. It is expected that other producers may eventually move operations to Mexico, or supply Mexico mills with presscake synthesized from crude dye imported into the U.S. and then sent to Mexico for application to textiles.

As a result of reduced demand, import pressures and increasing environmental costs, some U.S.-based operations have discontinued operations in recent years as noted above, while others have switched to importing crude dyes and then conducted the finishing and formulating in the United States. In recent years, there has also been some increase in the number of small, low-cost entrepreneurial dye finishers and formulators who have begun to carve out market shares which were once held by the major companies.

3.1.5 Global Industry Trends

In 1998, global consumption of dyes was believed to have dropped by almost 15 percent, from the 1997 levels, as a result of the financial crisis in Asia, changing fashion styles and other factors. From 1998 to 1999, production and consumption of dyes also decreased in the United States, Western Europe and Japan. [24]

Consumption of dyes is dependent on several factors. The primary long term factor is the demand for textiles, leather and colored paper. Since textiles are the largest end-use market for dyes, their consumption depends directly on population growth and consumer spending levels. Fashion is the primary short term factor, which influences the types of colors used. Another lesser but also important factor is the substitutability of organic pigments for dyes.

The dye industry has also experienced a significant amount of oversupply in the last few years, resulting in severe pressure on prices, which has led to most dye producers suffering significant losses and major restructuring, especially in the United States and Western Europe.[25]

In terms of demand, it is expected that there will be a significant and sustainable growth of the dye market primarily in Asia. For other international dye producers, less growth is expected due to the fall in prices from the Asian crisis in 1998 to 1999, as well as import pressures from Asian countries. Another factor which has affected these producers from more industrialized countries is the rising cost of disposing of relatively high quantities of hazardous organic wastes generated during production.

Table 3-4 represents the total value and quantity for organic dye and pigment imports in the U.S. from 1998 to 2002. The value of organic dye and pigment imports steadily declined by almost 30 percent from 1998 to 2001, when it reached $682.8 million. However, in 2001 the value increased to $716.3 million. In terms of quantity, the organic dye and pigment imports

---

[24] Ibid.

[25] Ibid.

experienced an increase from 1998 through 2000, then a slight decline in 2001, followed by a rebound in 2002.

Table 3-4. Total U.S. Value and Quantity of Imports of Organic Dyes and Pigments					
Product	1998	1999	2000	2001	2002
Total Value (million dollars)	970.0	939.7	843.9	682.8	716.3
Total Quantity (1,000 U.S. tons)	106.7	109.1	110.2	100.5	112.2
Unit Value (dollars/ton)	9,091	8,613	7,658	6,794	6,384
Source: Compiled from tariff and trade data from the U.S. Department of Commerce, the U.S. Treasury, and the U.S. International Trade Commission.					

Table 3-5, shows the total value and quantity for organic dye and pigment exports in the U.S. from 1998 to 2000. The annual value for organic dye and pigment exports has steadily declined over the five year period, from $699.3 million to $586 million. The production values for organic dye and pigment exports peaked at 113,000 tons in 2000, and then continued to decrease to about 85,000 tons in 2002.

Table 3-5. Total U.S. Value and Quantity of Exports of Organic Dyes And Pigments					
Product	1998	1999	2000	2001	2002
Total Value (million dollars)	699.3	682.5	726.6	632.5	586.0
Total Quantity (1,000 U.S. tons)	94.0	99.5	113.0	97.3	84.6
Unit Value (dollars/ton)	7,439	6,859	6,430	6,501	6,927
Source: Compiled from tariff and trade data from the U.S. Department of Commerce, the U.S. Treasury, and the U.S. International Trade Commission.					

3.2 Organic Pigments Industry Characteristics

This section presents an economic profile of the organic pigment industry which is classified under the North American Industry Classification System (NAICS) 325132, Synthetic Organic Dye and Pigment Manufacturing. The NAICS code for synthetic organic pigments specifically is 3251324. The following subsections describe selected characteristics of the organic pigments industry including products, affected facilities, market structure, and industry production and value.

3.2.1 Overview of Products

The Color Pigment Manufacturers' Association (CPMA) defines pigments as "colored, black, white, or fluorescent particulate organic or inorganic solids, which usually are insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate in which they are incorporated." According to the CPMA, the primary difference between pigments and dyes is that pigments are insoluble in the substrate during the application process while dyes are soluble in the substrate. Pigments retain a crystalline or particulate structure and impart color by selective absorption or by scattering of light.[26]

The approximate percentage of synthetic organic pigments by use during 1991-1995 was as follows: inks (60%), paints and coatings (25%), plastics (10%), and other (5%). Pigments are used primarily in printing inks. In 2002, the distribution was as follows: inks (67%), paints and coatings (16%), plastics (10%), and other (7%). There are fewer pigments produced than dyes. However, pigment batches generally are larger in size.[27] [28]

Organic pigments are derived in whole or in part from benzenoid chemicals and colors and are described as being toners or lakes. These pigments essentially are the same in final form, but differ in their preparation method. A lake is an organic pigment produced by the interaction of a soluble dye, a precipitant, and absorptive inorganic substrate. A toner is an insoluble colorant produced as a powder; some toners are extended by the inclusion of a solid diluent.

---

26 Dr. Joy Kunjappu, Ph.D., D.Sc., Chemical & Consulting, New York, "Pigments in Ink," posted on Paint & Coating Industry's (PCI) website on August, 28, 2000, http://www.pcimag.com/pci/cda/articleinformation/features/bnp__features__item/0,1846,9176,00.html

27 "Industry and Trade Summary Synthetic Organic Pigments," USITC Publication 3021, February 1997.

28 "The Organic Pigment Industry: Where its Been and Where its Going," Ink World, May 2003.

3.2.2 Profile of Industry Facilities - Organic Pigments

The 1997 Census of Manufacturers,[29] the most recent census data available, provides some information on the organic pigments industry. In 1992, there reportedly were 43 establishments listed under NAICS Code 3251324, Synthetic Organic Pigments, Lakes, and Toners. An estimated 4,600 individuals were employed by the industry and total industry wages were approximately $208 million.[30]

3.2.3 Global Industry Trends

In 1999, the world market value for colored pigments, both inorganic and organic, reached $7.5 billion, of which $4.9 billion was organic pigments[31]. Globally, Western Europe produced 37 percent of the world market share, followed by North America accounting for 28 percent, and Asia with 25 percent of the total market. North America and Europe are the largest markets for organic pigments. Along with Japan, these three regions account for the dominant share of high-performance pigments, which are the most profitable of organic pigments.

Figure 3-1 shows the world market value of organic pigments by chemical class for 1999. Azo pigments are the largest group of organic pigments, accounting for 59 percent of the world market value share in 1999, followed by phthalocyanines, with a share of 29 percent, and high-performance pigments accounting for the remaining 12 percent.

The global pigment industry, particularly, the organic pigment business, is expected to change steadily during the next decade. The industry will continue to experience challenges due to the rapid globalization of the business, environmental pressures, the maturing markets in some applications and regions, and the continued oversupply of phthalocyanine and azo pigments, which keeps prices depressed.

The growth in the printing inks, paints and coatings, and plastics industries, is primarily what drives the consumption of pigments. During 1999 to 2004, color organic pigment consumption in North America, Western Europe and Asia, will grow 2.5 to 3.0 percent per year by volume. The growth rate will be highest in plastic applications, where the development and use of speciality high-performance organic products continues to increase.[32]

---

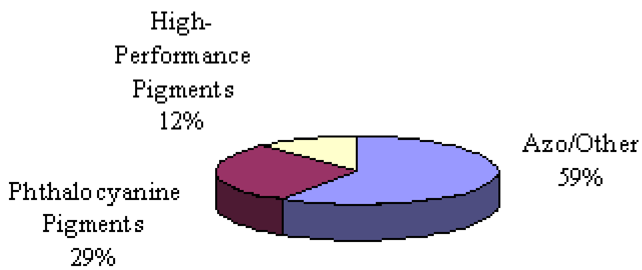
29 Synthetic Organic Dye and Pigment Manufacturing, Manufacturers-Industry Series, Census Bureau, Department of Commerce 1997.

30 Ibid.

31 “Chemical Economic Handbook Marketing Research Report - Pigments,” SRI International, 2001.

32 “Chemical Economic Handbook Marketing Research Report - Pigments,” SRI International, 2001.

Figure 3-1. World Market Value of Organic Pigments by Chemical Class, 1999



Total Market Value - $4.9 billion

Source: "Chemical Economic Handbook Marketing Research Report - Pigments," SRI International, 2001.

The total value and quantity of imports and exports of organic dyes and pigments were presented previously in Tables 3-4 and 3-5. The value of organic dye and pigment imports fell from 1998 to 2002, as did export values. Production levels for organic dye and pigment imports increased from 1998 to 2002, while their exports declined over the same time period.

In terms of capacity, organic pigment plant demographics have shown that an increase in global production capacity has far out-paced the growth of consumption. Table 3-6 shows the relationship of consumption versus capacity for the last five years. Table 3-7 shows the organic pigment usage by industry for 2002. Of all the industries, the printing ink industry uses the highest amount of organic pigment, 143,000 metric tons, followed by coatings, and plastics.[33]

---

[33] "The Organic Pigment Industry: Where its Been and Where its Going,," Ink World, May 2003.

Table 3-6. Global Capacity Utilization for the Pigment Industry				
	Capacity (1,000 Metric Tons)	Consumption (1,000 Metric Tons)	Excess Capacity (1,000 Metric Tons)	Capacity Utilization
1998	270	210	60	78%
1999	275	218	57	79%
2000	280	227	53	81%
2001	285	211	74	74%
2002	288	213	75	74%

Source: "The Organic Pigment Industry: Where its Been and Where its Going," Ink World, May 2003.

Table 3-7. Organic Pigment Usage by Industry, 2002	
Industry	Usage (Metric Tons)
Printing Ink	143,000
Coatings	34,000
Plastics	21,000
Others	15,000
Total	213,000

Source: "The Organic Pigment Industry: Where its Been and Where its Going," Ink World, May 2003.

3.2.4 Domestic Industry Market and Trends

During the last decade, the color pigment industry underwent a period of restructuring in response to the globalization of pigment markets, competitive factors and the impacts of environmental regulations.

Many small producers were unable to compete with larger international firms, and were forced to either close down their plants or they were acquired by larger, mainly Western European or Japanese firms. Product lines were realigned towards more higher-value pigments, which were more profitable. [34]

[34] Ibid.

During the past ten years, the organic pigments market has grown in volume, while at the same time plant closures and company merger have led to increased industry consolidation. Growth in organic pigment production is generally related to the overall economy and more directly to printing inks, which are the largest market segment. In the past two decades, growth in production has been concentrated in phthalocyanine pigments and the high-performance pigments, such as quinacridones and perylenes.

3.2.5 Industry Production and Value

The synthetic organic pigments industry is a mature, slow growth industry, whose products are purchased by intermediate industries according to specific requirements for a final product. Inks account for over half of total pigment sales followed by paints and coatings, and plastics. The highest growth rate in organic pigment production is expected in plastics applications, where development and use of specialty high performance organic products continues to increase.[35]

Due to its end-uses, pigments consumption generally is dependent on general business conditions. Coatings and plastics are purchased in large quantities by the housing and automobile industries, both highly cyclical industries. Colored inks are used in advertising, which to a lesser extent also is cyclical.

In recent years two developments have impacted the costs, production schedules, and competitiveness of the pigments industry in most of the world's developed countries: 1) the cost and uncertain availability of chemical intermediates and 2) stricter environmental regulations.[36]

Sales of synthetic organic pigments in the U.S. may take place through one of three distribution channels, which are: 1) directly from producer or importer to pigment consumer, 2) indirectly through distributors, or 3) indirectly through other pigment manufacturers. Published list prices are available, however, prices fluctuate frequently based on supply and demand. Quantity discounts also reportedly influence pricing significantly. Table 3-8 provides the production values for the organic pigment industry from 1997, with projects through 2005.

U.S. production of organic pigments increased by 5 percent during 1997 to 1999, from 75,500 tons to 79,500 tons. Production is estimated to increase at an average annual rate of 2.7 percent through 2005.

---

[35] Ibid.

[36] Industry and Trade Summary Synthetic Organic Pigments," USITC Publication 3021, February 1997.

Table 3-8. Total U.S. Production for Organic Color Pigments	
Year	U.S. Production (1,000 U.S. Tons)
1997	75.5 *
1998	77.5 *
1999	79.5 **
2003	88.5 ***
2004	91.0 ***
2005	93.5 ***

* Source: Will, Raymond and Akihiro Kishi. SRI International, The Chemical Economics Handbook, 2001. CEH Marketing Research Report - Pigments. (See page 5: Supply and Demand by Region. Estimated at 2.7 percent average annual growth from base of 159.2 in 1999. Projected back to 1997 - 1998, and through 2005.)
** Source: Will, Raymond and Akihiro Kishi. SRI International, The Chemical Economics Handbook, 2001. CEH Marketing Research Report - Pigments. (See page 3 of World Production and Demand Summary).
*** Estimated from: Will, Raymond and Akihiro Kishi. SRI International, The Chemical Economics Handbook, 2001. CEH Marketing Research Report - Pigments. (See page 5: Supply and Demand by Region. Estimated at 2.7 percent average annual growth from base of 159.2 in 1999. Projected back to 1997 - 1998, and through 2005.)

Table 3-9, shows the average per unit values for organic pigments, from 1998 to 2002. During this time period, prices fell by 16 percent from 1998 to 2000, however, were on the rise from 2001 to 2002 and increased by 6 percent.

Table 3-9. Average Per-unit Values for Organic Color Pigments	
Year	Price (dollars/ton)
1998	7,621
1999	6,931
2000	6,416
2001	6,450
2002	6,853

Source: Based on USITC export price and quantity data for organic pigments and color lakes included in HTS 320417 and 320500.

Table 3-10 presents 1997 Census of Manufacturing data depicting value of shipments by facility employment. The Census identified 43 pigment facilities, plus an additional 32 facilities which manufactured dyes or pigments, or both which accounted for only 2.5 percent of total industry production.

Table 3-10. Pigment Facility Size Distribution, Production and Sales*

Employment Per Facility	Number of Facilities	Value of Shipments (Million dollars)	Aggregate Estimated Production (1000 U.S. tons)	Average Sales/ Facility ($1,000)
1-19	10	47.4	2.6	$4,736
20-99	17	269.2	15.0	$15,834
>100	16	1,149.4	63.9	$71,835
Total	43	1,466.0	81.5	$34,093

Source: Synthetic Organic Dye and Pigment Manufacturing, Manufacturers-Industry Series, Census Bureau, Department of Commerce 1997.
*Estimates derived from 1997 Census of Manufacturers for Synthetic Organic Dye and Pigment Manufacturing. Census only reports number of dye facilities and total value of pigment shipments. Of the 112 facilities reported in the synthetic dyes and pigments industries, only 80 (37 dye and 43pigment) were classified; the remaining 32 facilities were not specified by kind.
These very small facilities accounted for approximately 2.5% of total industry shipments.

Chemical Intermediates

During the manufacturing process, certain advanced chemical intermediates are produced. These intermediates are critical to a specific class of pigments, have their own markets, and are traded worldwide. Industry experts have noted that these intermediates can account for as much as 60 percent of the cost of a pigment thus, making them a critical factor in determining a pigment's ultimate price.[37] During the 1980s several of the major manufacturers ceased production of many of the intermediates used in the production of pigments in part due to supply shortages, but also due to increased regulations in Western Europe, Japan and the United States.[38]

This shortage of pigment intermediates resulted in significant price increases in the pigments industry. In an attempt to counter price increases, many U.S. manufacturers as well as pigment manufacturers in other industrialized countries sought new intermediate supply sources in developing countries and/or temporary suspensions of U.S. duties on imported intermediates. It has been reported, however, that to date, developing countries do not have sufficient capacity to

---

37 "Industry and Trade Summary Synthetic Organic Pigments," USITC Publication 3021, February 1997.

38 Ibid.

meet industry needs. As a result of these shortages chemical intermediate prices have increased on average about 20 percent since 1990.[39]

3.3 Food Drug and Cosmetic Colorant Industry Characteristics

FD&C colorants are dyes and pigments that have been certified or provisionally certified by the Food and Drug Administration (FDA) for use in food items, drugs, and/or cosmetics. Typically, FD&C colorants are azo, anthraquinone, or triarylmethane dyes with azo representing the largest category. These products are similar or identical to larger-volume dye products not used in food, drugs, and cosmetics.

Manufacturers of FD&C colorants are included in several NAICS industries, including: 325132--Synthetic Organic Dye and Pigment Manufacturing; 311942--Spice and Extract Manufacturing; 311930--Flavoring Syrup and Concentrate Manufacturing; and, 325199--All Other Basic Organic Chemical Manufacturing. FD&C colorant manufacturers are only a very small segment of these industry groupings and accordingly a Census of Manufacturers industry overview is not practical. However, specific FD&C manufacturers expected to be affect by this rule are included in the facility-specific overview presented in Section 3.4.

FD&C dyes chemically consist of azo, anthraquinone, carotenoid and triarylmethane compounds. These compounds are consumed in smaller volumes than the major application classes (i.e., acid, basic, direct, disperse, reactive, solvent and vat dyes and fluorescent brighteners).

3.4 Overview of Affected Facilities

The Agency estimates that a total of 37 facilities manufacturing organic dyes, pigments and FD&C colorants may be affected by the proposed waste listing. These facilities are identified in Table 3-11 below , including estimated revenues derived from all on-site synthetic organic dye, pigment, and FD&C production.

---

[39] Ibid.

Table 3-11. Overview of Facilities Potentially Impacted by the Proposed Waste Listing		
Company and Facility Location	Estimated Total Annual Revenues from Production of All Synthetic Organic Dyes, Pigments, & FD&C Products * (2003 dollars)	Affected Products Produced
Abbey Color, Inc., Philadelphia, PA	4,953,000	Dyes
AC&S, Incorporated, Nitro, WV	9,906,000	Dyes
Apollo Colors, Rockdale, IL	62,007,000	Pigments
BASF Corporation, Huntington, WV	319,979,000	Dyes, Pigments
Bayer Corporation, Charleston, SC	298,998,000	Dyes, Pigments
Berwind Group, West Point, PA	9,846,000	FD&C Colorants
CDR Pigments and Dispersions, Cincinnati, OH		Pigments
CDR Pigments and Dispersions, Elizabethtown, KY		Pigments
CDR Pigments and Dispersions, Holland, MI		Pigments
TOTAL - CDR Pigments and Dispersions	248,817,000	Pigments
Chemical Compounds, Inc., Newark, NJ	3,153,000	FD&C Colorants
Ciba Geigy Specialty Chemicals, St. Gabriel, LA (excludes Novartis)	131,969,000	Dyes
Clariant Corporation, Coventry, RI		Pigments
Clariant Corporation, Martin, SC		Dyes
TOTAL - Clariant Corporation	422,685,000	Dyes, Pigments
Daicolor-Pope, Inc, Patterson, NJ	16,599,000	Pigments
Dye Specialties**, Jersey City, NJ	7,882,000	Dyes
Eastman Chemical, Kingsport, TN	53,166,000	Dyes
Engelhard Corporation, Louisville, KY	133,325,000	Pigments
European Color, PLC., Fall River, MA	67,609,000	Pigments
Galaxie Chemical, Paterson, NJ	4,204,000	Pigments
Industrial Color Company, Inc., Joliet, IL	5,255,000	Pigments
Lobeco Products, Incorporated, Lobeco, SC	14,079,000	Dyes
Magruder Color Company, Cartaret, NJ		Pigments
Magruder Color Company, Elizabeth, NJ		Pigments
TOTAL - Magruder Color Company	118,234,000	Pigments
Max Marx Color, Irvington, NJ	6,306,000	Pigments
Nation Ford Chemical Company, Fort Mill, SC	7,500,000	Dyes

Table 3-11. Overview of Facilities Potentially Impacted by the Proposed Waste Listing		
Company and Facility Location	Estimated Total Annual Revenues from Production of All Synthetic Organic Dyes, Pigments, & FD&C Products * (2003 dollars)	Affected Products Produced
Noveon Incorporated, Cincinnati, OH (formerly Goodrich)	955,142,000	Dyes, Pigments, FD&C
Passaic Color and Chemical, Paterson, NJ	21,019,000	Dyes
Rose Color, Newark, NJ	5,449,000	Dyes
Sensient Technologies, St Louis, MO		Dyes, FD&C
Sensient Technologies, Elmwood Park, NJ		Dyes
Sensient Technologies, South Plainfield, NJ		FD&C
TOTAL - Sensient Technologies Corp	158,762,000	Dyes, FD&C
Sun Chemical Corp, Rosebank, NY		Pigments, FD&C
Sun Chemical Corp, Muskegon, MI		Pigments
Sun Chemical Corp, Cincinnati, OH		Pigments
TOTAL - Sun Chemical Corp	159,684,000	Pigments, FD&C
Synalloy Corporation, Spartanburg, SC	92,959,000	Dyes, Pigments
United Color Manufacturing, Inc., Newton, PA	2,102,000	Dyes
Yorkshire Chemical, Lowell, NC	84,245,000	Dyes
Total	$3,425,834,000	

* Source: EPA estimate based on gross corporate revenues times average percent of total revenues derived from synthetic organic dyes, pigments, and FD&C products for small and large companies (See Chapter 4, Section 4.2.1).

** This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain.

4.0 HAZARDOUS WASTE GENERATION AND MANAGEMENT

Nonwastewaters generated during the production of dyes, pigments, and FD&C colorants are proposed for a contingent hazardous waste listing action under the Resource Conservation and Recovery Act (RCRA). This section presents estimates of the quantity of waste generated, current (baseline) management practices, compliance management practices available after listing, and the unit costs and prices for managing these wastes.

Limited public information is available by which to characterize the industries' waste generation and management. To complete this assessment EPA relied upon previously completed studies of the dyes, pigments, and FD&C industries and their sales, waste generation and management.

4.1 Proposed Listed Waste

This rule proposes to list organic dye, pigment, and FD&C manufacturing waste nonwastewaters (K181). For the purposes of the K181 listing, dyes and/or pigments production is defined to include manufacture of the following product classes: dyes, pigments, or FDA certified colors that are classified as azo, triarylmethane, or anthraquinone classes. Azo products include azo, monoazo, diazo, triazo, polyazo, azoic, benzidine, and pyrazolone products. Anthraquinone products include anthraquinone and perylene products. Triarylmethane products include both triarylmethane and triphenylmethane products. Organic dye, pigment or FD&C manufacturing nonwastewaters include, but are not limited to: spent catalysts, spent adsorbents, equipment cleaning sludge, product standardization filter cake, filter aid, dust collector fines, recovery still bottoms, and wastewater treatment sludge.

Azo dyes are typically formed by a diazotization reaction, which involves forming a diazonium ion from an aromatic amine using nitrous acid. A typical azo dye manufacturing process may include the following steps: slurry of raw materials, pre-reaction of raw materials, diazotization reaction, coupling reaction, filtration, drying, milling, standardizing, packaging, and shipping. The first three steps, slurrying, pre-reaction, and the diazotization reaction, occur in the same reaction vessel. This is referred to as a batch process operation. In this vessel, raw materials, water, and ice (for temperature control) are added, and the solution is agitated. The coupling reaction is conducted under controlled pH. The product stream is pumped to a large plate and frame filter press where it is isolated and collected as filter press cake. The filter cake is the product material. The filtration generates a large volume wastewater stream consisting of concentrated mother liquors and subsequent wash waters. The product filter press cake is transferred to containers and may be either sold in this wet form or further processed. Further processing includes drying and pulverizing into a fine powder. Drying may be performed via tray, conveyer belt, spray, or other drying techniques.[40]

---

[40] Austin, George T, *Shreve's Chemical Process Industries*, 5th edition, McGray-Hill Book Company, 1984; "Dye Manufacturing," Pollution Prevention Abatement Handbook, World Bank Group, effective July 1998, and "Pollution Prevention and Abatement Guidelines for Dye Manufacturing Industry," World Bank, May 9, 2002: http://www.cleantechindia.com/eicimage/210602_24/Dye-GUIDELINE.htm

Anthraquinone dyes are commonly formed by a Freidel-Crafts reaction in which phthalic anhydride and benzene are reacted in the presence of aluminum chloride to form o-benzoylbenzoic acid. Closure of the aromatic ring in the intermediate gives the corresponding anthraquinone. Substitutions on anthraquinone rings, which produce the final product, may include nitro-, halo-, sulfonic-, carboxylic, hydroxy, ether, and amino-groups. The general manufacturing process used in the production of anthraquinone dyes is similar to the process for azo dyes.[41]

Triarylmethane dyes are synthesized industrially using the benzaldehyde, ketone (Michler's ketone), and diphenylmethane methods. The choice of process is determined by the structure of the dye manufactured. The general manufacturing process used in the production of triarylmethane dyes is similar ro the process used for azo dyes.[42]

FD&Cs are a class of dyes. They would be produced in a similar manner to the dye manufacturing process described above.

The general process used in the manufacture of organic pigments (toners and lakes) is similar to the process used for dyes. However, pigments can be dispersed in an oil for use in offset inks or in polyethylene for use in plastics. The filter press cake is transported to a flusher, which is a mixer for blending in the oil or polyethylene and removing water from the wet filter cake.[43]

Some facilities recover spent solvents by distillation. Still bottoms and heavy ends must be discarded periodically.

4.2 Population of Impacted Dye, Pigment and FD&C Facilities and Expanded Scope Facilities

EPA conducted research to identify which dye, pigment and FD&C facilities may be impacted by the proposed listing and which non-dye, pigment and FD&C facilities (referred to as "expanded scope facilities") generate hazardous wastes that contain one or more of the three toxic constituents o-anisidine, p-cresidine, and 2,4-dimethylaniline associated with these identified wastes being added to the list of constituents that serves as the basis for classifying

---

41 U.S. EPA, Industrial Environmental Research Laboratory, Office of Research and Development, "Wastes from Manufacturer of Anthraquinone Dyes and Pigments," prepared by Julie E. Gwinn and David C. Bomberger, SRI International, July 31, 1983.

42 U.S. EPA, Industrial Environmental Research Laboratory, Office of Research and Development, "Wastes from Manufacturer of Diphenylmethane and Triarylmethane Dyes and Pigments," prepared by Julie E. Gwinn and David C. Bomberger, SRI International, July 31, 1983.

43 "Pigment in General," http://www.monokem.com/pigasgen.htm and Austin, George T, *Shreve's Chemical Process Industries*, 5th edition, McGray-Hill Book Company, 1984; "Dye Manufacturing," Pollution Prevention Abatement Handbook, World Bank Group, effective July 1998

wastes as hazardous (40 CFR 261, Appendix VIII).[44]

4.2.1 Dye, Pigment and FD&C Facilities

As noted previously, only limited information is available regarding how many of the dye and pigment manufacturing facilities generate the wastes considered in this listing. A determination regarding which facilities produced azo dyes and/or pigments was made as a result of meetings with the primary associations, including: Ecological and Toxicological Association of Dyes and Pigments Manufacturers (ETAD), and Color Pigments Manufacturers Association, Inc. (CPMA).

EPA estimates there are a total of 37 dye, pigment, and FD&C manufacturing facilities operating in the United States that may be impacted by the proposed rule (Appendix A). Of these 37 facilities, there are 18 potentially affected dye producers, 20 potentially affected pigment producers, and six FD&C producers (Appendix A).

The total synthetic organic dye and pigment industry revenues from the 1997 Census was adjusted to 2003 using a simple 3 percent annual adjustment factor. This number was increased by 10 percent to account for estimated FD&C revenues[45]. The total industry dye, pigment, and FD&C revenues were then apportioned among the 29 companies based on the gross corporate sales revenues, except for the very small companies where 97 percent of gross corporate revenues was assumed[46]. For multi-facility companies, the total dye, pigment and FD&C revenues were divided equally. However, when there was FD&C production only at one of the facilities in a multi-facility company, only ten percent of the total synthetic dye and pigment production revenues was assumed for that facility rather than equal portions. For example, if an impacted company had three facilities and two facilities manufacture pigments and only one facility manufactures FD&C, then the total synthetic dye, pigment and FD&C production revenue for that company was apportioned equally between the two pigment manufacturers (45 percent each) with the remaining 10 percent being assigned to the FD&C only manufacturer. The percent of affected production revenues is assumed to be 50 percent[47] for dye manufacturing,

---

44 Four constituents (aniline, phenylenediamine (which is likely a mixture of all three isomers), 4-chloroaniline, and toluene-2,4-diamine already are on the 40 CFR Part 261 Appendix VIII list of constituents. Expanded scope facilities are already sampling for and treating these constituents to be in compliance with current regulations.

45 Approximate average proportion of annual gross revenues derived from FD&C production for companies that manufacture synthetic organic dyes, and/or organic pigments, plus FD&C.

46 Based on available data sources indicating estimated dye and pigment revenues as percent of total gross revenues for affected small companies.

47 Estimate derived from the public outreach document: U.S. EPA Office of Solid Waste, *Regulatory Flexibility Screening Analysis - Proposed Listing as RCRA Hazardous Waste and Land Disposal Restrictions (LDRs) for Wastewaters and Wastewater Treatment Sludge from the Production of Azo Dyes and Pigments, and Still Bottoms from the Production of Triarylmethane Dyes and Pigments - Draft report*, November 9, 2000. [Note: No public comments were received

90 percent[48] for pigment manufacturing, and 80 percent[49] for FD&C manufacturing.

We have identified the presence of one or more of the eight Constituents of Concern[50] (CoCs) at 16 of the 37 potentially affected facilities (Table 4-1). This determination is based on the following sources: Toxics Release Inventory (TRI), National Hazardous Waste Constituent Survey (NHWCS), Colour Index, 2001 SRI Directory of Chemical Producers, public comments on prior proposed dye and pigment listings, and non-confidential business information (CBI) from the 3007 RCRA Questionnaire. We base our most likely impacted analytical scenario using these 16 facilities. Four of these 16 facilities[51] may generate wastes that contain toluene-2,4-diamine. This constituent has a nonconditional listing mass-loading limit (Table 2-2). However, one of the four facilities (Dye Specialties[52]) is not likely to exceed the mass-loading level because we estimate that this facility generates very small quantities of nonwastewaters (see Table 4-6).

A total of 15 of the 29 companies have been identified as small using the SBA definition of 750 employees at the corporate level. Appendix A identifies which facilities are small. Four of the small entities generate wastes that may contain one or more of the eight CoCs.

---

challenging this estimate.]

48 Source: Public comment from the Color Pigments Manufacturers Association, Inc., January 4, 2001. Comment on page 3 states: In those facilities producing azo pigments this number is actually in excess of 80%." As a result of this comment an estimate of 90 percent was applied in this analysis.

49 EPA estimate.

50 Aniline, o-anisidine, 4-chloroaniline, p-cresidine, 2,4-dimethylaniline, 1,2-phenylenediamine, 1,3-phenylenediamine, and toluene-2,4-diamine.

51 A fifth facility, Abbey Color, Inc. was identified as possibly generating toluene-2,4-diamine. However, it is uncertain if this is contained in a reformulated product only, or in actual manufacturing.

52 This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain.

Table 4-1. Dye and Pigment Facilities with Identified Constituents of Concern	
Company and Facility Location	Identified Constituents of Concern
Abbey Color, Inc., Philadelphia, PA	2,4-dimethylaniline, toluene-2,4-diamine, 1,3-phenylenediamine, aniline, o-anisidine, p-Cresidine
AC&S, Incorporated, Nitro, WV	None
Apollo Colors, Rockdale, IL	None
BASF Corporation, Huntington, WV	p-cresidine 1,3-phenylenediamine aniline
Bayer Corporation, Charleston, SC	toluene-2,4-diamine, 4-chloroaniline, o-anisidine, p-cresidine, aniline
Berwind Group, West Point, PA (Colorcon)	None
CDR Pigments and Dispersions, Cincinnati, OH (Flint Ink)	1,3-phenylenediamine, aniline
CDR Pigments and Dispersions, Elizabethtown, KY (Flint Ink)	None
CDR Pigments and Dispersions, Holland, MI (Flint Ink)	aniline
Chemical Compounds, Inc., Newark, NJ	None
Ciba Geigy Specialty Chemicals, St. Gabriel, LA (excludes Novartis)	o-anisidine, p-cresidine, 1,2-phenylenediamine, 1,3-phenylenediamine, aniline
Clariant Corporation, Coventry, RI	o-anisidine 1,2-phenylenediamine aniline
Clariant Corporation, Martin, SC	o-anisidine aniline
Daicolor-Pope, Inc, Patterson, NJ	None
Dye Specialties*, Jersey City, NJ	toluene-2,4-diamine,

Table 4-1. Dye and Pigment Facilities with Identified Constituents of Concern	
Company and Facility Location	Identified Constituents of Concern
	1,3-phenylenediamine, aniline
Eastman Chemical, Kingsport, TN	aniline
Engelhard Corporation, Louisville, KY	None
European Color, PLC., Fall River, MA (EC Pigments, Roma Colour)	None
Galaxie Chemical, Paterson, NJ	None
Lobeco Products, Incorporated	None
Industrial Color Company, Inc., Joliet, IL	None
Magruder Color Company, Cartaret, NJ (includes Uhlich)	None
Magruder Color Company, Elizabeth, NJ (inlcudes Uhlich)	None
Max Marx Color, Irvington, NJ	None
Nation Ford Chemical Co., SC	aniline
Noveon Incorporated, Cincinati, OH (formerly Goodrich)	1,2-phenylenediamine
Passaic Color and Chemical (Royce Associates, LP), Paterson, NJ	toluene-2,4-diamine, 2,4-dimethylaniline, o-anisidine, 1,2-phenylenediamine, 1,3-phenylenediamine, aniline
Rose Color, Newark, NJ	None
Sensient Technologies, St Louis, MO	aniline
Sensient Technologies, Elmwood Park, NJ	None
Sensient Technologies, South Plainfield, NJ	None
Sun Chemical Corp, Rosebank, NY (Parent-Dainippon Ink and Chemicals)	None
Sun Chemical Corp, Muskegon, MI (Parent-Dainippon Ink and Chemicals)	aniline
Sun Chemical Corp, Cincinnati, OH (Parent-Dainippon Ink and Chemicals)	None
Synalloy Corporation, Spartanburg, SC (owns Blackman Uhler)	None

Table 4-1. Dye and Pigment Facilities with Identified Constituents of Concern	
Company and Facility Location	Identified Constituents of Concern
United Color Manufacturing, Inc., Newton, PA	None
Yorkshire Americas, Lowell, NC	toluene-2,4-diamine, o-anisidine, p-cresidine, 1,2-phenylenediamine, 1,3-phenylenediamine, aniline

Note: Findings in this table reflect verified constituents based on available non CBI sources identified at the time of this analysis. This list may not be fully comprehensive. Facilities in **bold** were identified with constituents of concern.

* This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain

4.2.2 Expanded Scope Facilities

Non-dye, pigment and FD&C facilities (i.e., expanded scope facilities) may be indirectly impacted if they generate wastes containing one or more of three constituents of concern (o-anisidine, p-cresidine, and 2,4-dimethylaniline).[53] These are constituents not currently on 40 CFR Part 261, Appendix VIII. Appendix B of this report presents a list of the 13 facilities that were identified as manufacturing or using one of the three CoCs. The list includes the facility name, address, size (according to Small Business Administration standards), and SIC/NAICS codes. Table 4-2 below presents a summary of the number of expanded scope facilities generating wastes that potentially contain one of the three CoCs. One of these companies has been identified as being a small business, as defined by the SBA.

[53] Four constituents (aniline, phenylenediamine (which is a mixture of all three isomers), 4-chloroaniline, and toluene-2,4-diamine) already are on the 40 CFR Part 261 Appendix VIII list of constituents. Expanded scope facilities are already sampling for and treating these constituents to be in compliance with current regulations.

Table 4-2. Summary of Expanded Scope Facilities*				
Constituent	Number of Facilities	Number of Small Companies	SIC Codes	NAICS Codes
2,4-Dimethylaniline	9	1	2865, 2869, 5169	32511, 325192, 42269
o-Anisidine	1	0	2869	32511, 325192
p-Cresidine	3	0	2865, 2869	32511, 32512, 325199
TOTALS	13	1		

* Expanded scope facilities were identified through a search of the following databases:

- EPA Toxics Release inventory database;
- Chemical Manufacturer and Product Database by ChemChannels.com; and
- Cornell University, Department of Environmental Health and Safety, Material Safety Data Sheets database that contains ~ 250,000 MSDS files derived from:
  - the U.S. Government Department of Defense MSDS database available for purchase from Solutions Software
  - data from siri.uvm.edu.
  - MSDS sheets maintained by Cornell University Environmental Health and Safety and other Cornell departments.

4.3 Annual Waste Generation

Wastewater and wastewater treatment sludge quantities are estimated for the list of 37 dye, pigment, and/or FD&C manufacturing facilities operated by 29 companies. Wastewater quantities were estimated in order to derive wastewater treatment sludge quantity estimates.

Annual wastewater generation was estimated for the 37 facilities based on several sources. Facility specific information was available for all eight direct dischargers and five indirect dischargers. Wastewater flow rates were estimated for the remaining 24 indirect dischargers based on dye and pigment production and wastewater flow data from a 1987 guidance document.

- Eight facilities were identified as direct dischargers to surface water from the EPA's 2003 Permit Compliance System (PCS) database. Their wastewater quantities were obtained from the PCS database. Average monthly flows were used to determine an average annual flow volume.

- A wastewater flow rate of 125,700 U.S. tons per year was provided by the Synalloy, Spartansburg facility in their response to EPA's Surface Impoundment Study.

- A wastewater flow rate of 136,985 U.S. tons per year for the Galaxie Chemical Corporation facility was provided in a public comment (docket list #DPLP-00012) on the 1994 proposed listing.

- A press release from the CDR, Elizabethtown facility stated that the facility installed a reverse osmosis wastewater treatment system that will reduce their wastewater discharge to the POTW by 95 percent. Prior to installation of the new treatment system the facility discharged 2,711 U.S. tons per day (989,333 U.S. tons per year) to the POTW. It is estimated that with the reverse osmosis system operating the facility will discharge 49,467 U.S. tons of wastewater to the POTW per year.

- The Ciba-Geigy Corporation, St. Gabriel facility, reported in a December 15, 1995 non-CBI comment, that they treatment 125,100 U.S. tons per year of wastewater. This facility reports that they use several wastewater treatment methods including metals precipitation, reverse osmosis, ammonia removal, and carbon adsorption. The wastewater discharge flow rate was adjusted based on the use of this system. It was assumed that this facility would recycle a similar percentage (95 percent) of its wastewaters as the CDR, Elizabethtown facility that also uses reverse osmosis. Therefore, the estimated wastewater discharge rate is 6,255 U.S. tons per year.

- An estimated flow rate of 1,062,562 U.S. tons per year was estimated for Noveon Incorporated, Cincinnati, Ohio facility based on data from a December 2000 Inspection Report by the Metropolitan Sewer District of Greater Cincinnati.

- Wastewater generation was estimated for the remaining 24 facilities based on revenue data compared to the statistics on indirect dischargers from the Specialty Organics category in the 1987 document: Development Document for Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatment Standards for the Organic Chemicals and the Plastics and Synthetic Fibers Point Source Category Report (OCPSF Effluent Guidelines). The wastewater flow statistics (mean, median, standard deviation, and sample size) for the Specialty Organics Category as reported in the OCPSF Effluent Guidelines background document were used. The data in the OCPSF are from 1980 reported waste volumes. The sample included 90 plants where at least 70 percent of their production was related to the Specialty Organics subcategory (Table 4-3).

Table 4-3 Wastewater Flow Statistics for the Specialty Organics Category * (gallons per day)			
Number of Plants	Mean	Median	Standard Deviation
90	360,000	70,000	1,630,000
* Data obtained from Table V-10, page V-14, from the 1987 OCPSF Effluent Guidelines report			

A log normal distribution of wastewater quantities was developed from these statistics. The log-normal distribution is widely used where, 1) values are positively skewed with most of the values near the lower limit; 2) the variable can increase without limits, but cannot fall below zero; and, 3) the coefficient of variability (the ratio of the standard deviation to the mean) is greater than 30 percent. The wastewater flow statistics met these three criteria. The coefficient of variability for the wastewater flow data was 453 percent. The software program Crystal Ball was used to develop a distribution curve for the wastewater data. The Crystal Ball program uses a Monte Carlo technique to create a distribution of outcomes over thousands of iterations (50,000 in this case). From the distribution created by the Crystal Ball software, the wastewater quantities were determined for every fifth percentile (Table 4-4).

Based on the production revenue data obtained for each dye and pigment facility a corresponding production revenue percentile was assigned to each of the indirect dischargers. It was assumed that the quantity of product produced directly correlated with the quantity of wastewater generated. For example, if a facility's product production revenue was at the 90th percentile level it will generate wastewater at the 90th percentile level as well (Table 4-4)

Table 4-4
Percentile Distributions of Dye, Pigment and FD&C Production Revenues and Wastewater Generation

Percentile	Production Revenues dollars/year	Wastewater Generation (GPD)	Percentile	Production Revenues dollars/year	Wastewater Generation (GPD)
0%	$388,289	100	55%	$43,598,629	95,790
5%	$1,612,435	4,370	60%	$52,419,069	119,680
10%	$2,979,621	8,170	65%	$53,828,560	151,080
15%	$3,774,173	12,430	70%	$55,055,234	192,900

Table 4-4 Percentile Distributions of Dye, Pigment and FD&C Production Revenues and Wastewater Generation					
Percentile	Production Revenues dollars/year	Wastewater Generation (GPD)	Percentile	Production Revenues dollars/year	Wastewater Generation (GPD)
20%	$5,032,231	17,480	75%	$60,989,031	250,510
25%	$8,672,842	23,490	80%	$64,649,531	335,710
30%	$10,570,274	30,500	85%	$72,416,728	470,530
35%	$13,505,525	38,900	90%	$86,430,456	717,020
40%	$23,895,654	49,400	95%	$217,601,575	1,334,220
45%	$32,962,341	61,760	100%	$668,129,092	15,241,560
50%	$42,477,477	76,490			

Annual wastewater treatment sludge generation rates were estimated for the 37 facilities based on two sources:

1) Wastewater Characteristics

Wastewater treatment sludge generation rates were estimated for 35 facilities based on data from the 1987 OCPSF Effluent Guidelines report. The sludge generation rates were estimated based on wastewater characteristics reported, such as total suspended solids (TSS). It was assumed that activated sludge was the wastewater treatment method and that the sludge was dewatered on a belt filter press prior to disposal. The OCPSF report states that these are the primary wastewater treatment methods used in the Specialty Chemical industry.

The TSS values reported in the 1987 OCPSF Effluent Guidelines Report are presented in Table 4-5. The large standard deviations presented in this data, and the fact that the mean values are significantly greater than the median values, indicate that the mean values are upwardly skewed by a few large values in the population. Therefore, the median values are assumed to be more appropriate representation of the expected influent concentrations. The median TSS concentration of 194 mg/L is used to calculate the sludge generation rates at direct dischargers and the median TSS concentration of 151 mg/L is used to calculate the sludge generation rates at indirect dischargers. PCS data were used to identify facilities that have NPDES discharge permit (i.e., direct dischargers). All other facilities are assumed to discharge to a POTW (i.e., indirect dischargers) given they are not listed in the PCS database. In addition, a high sludge generation rate was developed for each facility using the mean TSS concentrations of 404 mg/L and 465 mg/L for direct and indirect dischargers, respectively.

Table 4-5 Raw Wastewater Total Suspended Solids Concentrations * (mg/L)				
Discharge Pattern	Number of Plants	Mean	Median	Standard Deviation
Direct Dischargers	10	404	194	528
Indirect Dischargers	40	465	151	1245

* Data obtained from table V-34 from the OCPSF Effluent Guidelines report

The typical solids content of waste activated sludge from a secondary clarifier is one to four percent.[54] The typical dewatering performance from a belt filter press of waste activated sludge is a cake solid of 12 percent to 20 percent.[55] The typical solids concentration from belt filter press filtration with chemicals is 15 percent to 30 percent with a typical value of 22 percent.[56] The typical level of polymer addition to waste activated sludge when going to a belt filter press for dewatering is eight to 20 pounds of dry polymer added per ton of dry solids.[57]

As described above, influent wastewater average TSS concentrations of 151 mg/L to 465 mg/L for indirect dischargers and 194 mg/L to 404 mg/L for direct dischargers are assumed prior to entering the activated sludge wastewater treatment system. According to the OCPSF Effluent Guidelines, activated sludge treatment results in a median removal efficiency of 81 percent for TSS.[58] It is assumed that the direct dischargers will treat their waste to a higher level than indirect dischargers. This can be accomplished through process modifications to improve the efficiency of the biological treatment system, the secondary clarification system, or by installing tertiary treatment such as polishing ponds. Simple modifications to the secondary clarification systems, such as installation of flow-modifying structures and the addition of a stop gate prior to

---

[54] *Wastewater Engineering- Treatment, Disposal, and Reuse,* Metcalf and Eddy, Inc. Third Edition, 1991.

[55] Ibid.

[56] Ibid.

[57] Ibid.

[58] OCPSF Effluent Guidelines, page VII-64.

the clarifier, were shown to result in a 13 to 31 percent reduction in effluent TSS levels.[59] Based on these data, it is assumed that indirect dischargers would modify their treatment systems to reduce the effluent TSS levels by an average of 20 percent. Therefore, 81 percent of the TSS would be removed from the wastewater by the indirect dischargers and 85 percent of the TSS would be removed by the direct dischargers.

Waste activated sludge is estimated to contain two percent solids before entering the belt filter press. Twenty (20) pounds of dry polymer per ton of dry solids is assumed to be added to the waste activated sludge to improve it's dewatering characteristics. The addition of this polymer will increase the dry sludge by one percent. The belt filter press is assumed to dewater the sludge to 20 percent solids. Based on the assumed influent TSS concentrations, the treatment removal efficiencies, and the dewatered sludge characteristics, high and low sludge quantities are estimated for each of the 37 facilities. For indirect dischargers, wastewater to sludge generation ratios were determined to be 1,621 and 526 for low and high sludge generation amounts, respectively. For direct dischargers, wastewater and sludge generation ratios were determined to be 1,202 and 577 for low and high sludge generation amounts, respectively. The estimated sludge quantities are presented in Table 4-6. The total high and low sludge quantity estimates presented in this table were used in the cost and economic impact analysis. We were not able to estimate incremental nonwastewater quantities above loading limits.

[59] OCPSF Effluent Guidelines, page VII-78.

Table 4-6. Estimated Wastewater and Sludge Quantities										
Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
Abbey Color, Inc., Philadelphia, PA	$2,440,000	8,965	8,135	Indirect	6	5	17	15	based on revenue, indirect discharger
AC&S, Incorporated, Nitro, WV	$4,880,000	33,150	30,082	Direct	28	25	57	52	PCS database, direct discharger
Apollo Colors, Rockdale, IL	$54,981,779	268,147	243,328	Indirect	165	150	510	462	based on revenue, indirect discharger
BASF Corporation, Huntington, WV	$271,115,000	6,264,286	5,684,470	Indirect	3,866	3,508	11,906	10,804	based on revenue, indirect discharger
Bayer Corporation, Charleston, SC	$206,205,608	3,439,911	3,121,516	Direct	2,862	2,597	5,961	5,409	PCS database, direct discharger
Berwind Group, West Point, PA	$9,700,000	44,282	40,183	Indirect	27	25	84	76	based on revenue, indirect discharger
CDR Pigments and Dispersions, Cincinnati, OH	$72,806,580	791,211	717,977	Indirect	488	443	1,504	1,365	based on revenue, indirect discharger

Table 4-6. Estimated Wastewater and Sludge Quantities									
Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
CDR Pigments and Dispersions, Elizabethtown, KY (1)	$72,806,580	49,467	44,888	Indirect	27,635	25,077	27,635	25,077	based on website information regarding discharge rate, and ratio from Ciba Geigy for sludge generation from reverse osmosis
CDR Pigments and Dispersions, Holland, MI	$75,012,840	1,116,647	1,013,291	Direct	929	843	1,935	1,756	PCS database, direct discharger
TOTAL - CDR Pigments and Dispersions	$220,626,000	1,957,325	1,776,157		29,052	26,363	31,074	28,197	
Chemical Compounds, Inc., Newark, NJ	$3,106,315	17,625	15,994	Indirect	11	10	33	30	based on revenue, indirect discharger

Table 4-6. Estimated Wastewater and Sludge Quantities									
Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
Ciba Geigy Specialty Chemicals, St. Gabriel, LA (excludes Novartis) (2)	$65,009,539	6,255	5,676	Indirect	3,500	3,176	3,500	3,176	wastewater and sludge generation based on December 13, 1995 non-CBI comment on proposed listing, indirect discharger. Adjusted wastewater generation to account for recycle of 95% of the wastewater based on CDR experience with similar system.
Clariant Corporation, Coventry, RI	$187,397,143	1,238,896	1,124,225	Direct	1,031	935	2,147	1,948	PCS database, direct discharger
Clariant Corporation, Martin, SC	$104,109,524	3,701,673	3,359,050	Direct	3,080	2,795	6,414	5,821	PCS database, direct discharger
TOTAL - Clariant Corporation	$291,506,667	4,940,569	4,483,275		4,111	3,730	8,561	7,769	
Daicolor-Pope, Inc, Patterson, NJ	$14,718,269	71,989	65,328	Indirect	44	40	137	124	based on revenue, indirect discharger

Table 4-6. Estimated Wastewater and Sludge Quantities									
Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
Dye Specialties*, Jersey City, NJ	$388,289	156	142	Indirect	0.10	0	0.30	0	based on revenue, indirect discharger
Eastman Chemical, Kingsport, TN	$26,190,000 (estimated market value)	86,478	78,474	Indirect	53	48	164	149	based on revenue, indirect discharger
Engelhard Corporation, Louisville, KY	$118,219,500	1,654,990	1,501,806	Indirect	1,021	927	3,145	2,854	based on revenue, indirect discharger
European Color, PLC., Fall River, MA	$59,948,868	381,289	345,997	Indirect	235	214	725	658	based on revenue, indirect discharger
Galaxie Chemical, Paterson, NJ (3)	$3,727,578	136,985	124,305	Indirect	85	77	260	236	based on comment to proposed listing DPLP-00012
Lobeco Products, Incorporated	$6,935,500	520,295	472,137	Direct	433	393	902	818	PCS database, direct discharger
Industrial Color Company, Inc., Joliet, IL	$4,659,473	28,431	25,799	Indirect	18	16	54	49	based on revenue, indirect discharger

Table 4-6. Estimated Wastewater and Sludge Quantities									
Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
Magruder Color Company, Cartaret, NJ	$52,419,069	191,716	173,971	Indirect	118	107	364	331	based on revenue, indirect discharger
Magruder Color Company, Elizabeth, NJ	$52,419,069	191,716	173,971	Indirect	118	107	364	331	based on revenue, indirect discharger
TOTAL - Magruder Color Company	$104,838,138	383,432	347,942		237	215	729	661	
Max Marx Color, Irvington, NJ	$5,591,367	35,747	32,438	Indirect	22	20	68	62	based on revenue, indirect discharger
Nation Ford Chemical Co., SC (4)	7,500,000	1,642,277	1,490,270	Direct	1,367	1,240	2,846	2,582	PCS database, direct discharger
Noveon Incorporated, Cincinati, OH (formerly Goodrich)	$668,129,092	1,062,562	964,213	Indirect	656	595	2,019	1,833	based on revenue, indirect discharger
Passaic Color and Chemical, Paterson, NJ	$10,354,384	51,535	46,765	Indirect	32	29	98	89	based on revenue, indirect discharger
Rose Color, Newark, NJ	$2,684,000	13,738	12,466	Indirect	8	8	26	24	based on revenue, indirect discharger

Table 4-6. Estimated Wastewater and Sludge Quantities									
Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
Sensient Technologies, St Louis, MO	$43,796,480	160,342	145,501	Indirect	99	90	305	277	based on revenue, indirect discharger
Sensient Technologies, Elmwood Park, NJ	$31,283,200	98,490	89,374	Indirect	61	55	187	170	based on revenue, indirect discharger
Sensient Technologies, South Plainfield, NJ	$12,513,280	62,407	56,631	Indirect	39	35	119	108	based on revenue, indirect discharger
TOTAL - Sensient Technologies	$87,592,960	321,239	291,505		198	180	611	554	
Sun Chemical Corp, Rosebank, NY	$55,063,396	311,143	282,344	Indirect	192	174	591	537	based on revenue, indirect discharger
Sun Chemical Corp, Muskegon, MI	$42,477,477	116,420	105,644	Indirect	72	65	221	201	based on revenue, indirect discharger
Sun Chemical Corp, Cincinnati, OH	$42,477,477	116,420	105,644	Indirect	72	65	221	201	based on revenue, indirect discharger
TOTAL - Sun Chemical Corp	$140,018,350	543,983	493,632		336	305	1,034	938	
Synalloy Corporation, Spartangurg, SC	$64,109,520	125,700	114,065	Indirect	78	70	239	217	wastewater generation based on surface impoundment study, indirect discharger

Table 4-6. Estimated Wastewater and Sludge Quantities

Company and Facility Location	Estimated Total Annual Revenues from Impacted Dye, Pigment, and FD&C Production	Estimated Total Annual Quantity of Impacted Wastewater		Discharger Type	Low - Estimated Total Annual Quantity of Nonwastewater (using median TSS concentration)		High - Estimated Total Annual Quantity of Nonwastewater (using mean TSS concentration)		Waste Generation Assumptions
		U.S. tons of wastewater	Metric tons of wastewater		U.S. tons of nonwastewater	Metric tons of nonwastewater	U.S. tons of nonwastewater	Metric tons of nonwastewater	
United Color Manufacturing, Inc., Newton, PA	$1,035,438	5,348	4,853	Indirect	3	3	10	9	based on revenue, indirect discharger
Yorkshire Americas, Lowell, NC	$41,500,000	328,514	298,107	Direct	273	248	569	517	PCS database, direct discharger
TOTAL	$2,497,711,634	24,375,203	22,119,059		48,727	44,215	75,339	68,368	

(1) CDR Pigments, Elizabethtown -- Wastewater generation based on press release on company website (www.cdrpigments.com). Stated that facility uses 650,000 gallons per day in pigment processing and has reduced its discharge to the POTW by 95% by installing a Reverse Osmosis treatment system and recycling it's water. Assumed that sludge generation rates would be similar to that reported by Ciba Geigy who also uses a reverse osmosis treatment system.

(2) Ciba Geigy, St. Gabriel -- Wastewater generation based on 12/13/95 non-CBI comment on proposed listing. Stated that they treat 30,000,000 gallons per year on site. Assumed that similar to CDR Pigments they are able to recycle 95% of the wastewater and discharge 5%. Reported sludge generation of 3,500 tons per year.

(3) Galaxie Chemical Corporation. -- Wastewater generation based on comment #DPLP-00012. Stated that they currently discharge 90,000 gallons per day to a POTW.

(4) Wastewater generation quantities were obtained from the PCS database. A note indicated that this facility discharges the majority of its wastewater to a POTW by permit. It is assumed that this permitted discharge would have the stricter effluent guidelines than normal indirect discharge, therefore, the sludge production calculations for direct dischargers was applied.

* This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain

2) Facility Specific Information:

Facility specific information was used for the remaining two facilities. Both facilities reported using a reverse osmosis wastewater treatment system. The wastewater treatment sludge generation rate for one facility was estimated based on the calculated generation ratio for the other facility using reverse osmosis.

- In a December 15, 1995 non-CBI comment from the Ciba-Geigy Corporation, St. Gabriel facility they reported the treatment of 125,100 tons per year of wastewater and 3,500 tons of sludge per year. This facility reports that they use several wastewater treatment methods including metals precipitation, reverse osmosis, ammonia removal, and carbon adsorption. It was assumed that this facility would recycle a similar percentage (95%) of its wastewaters as the CDR, Elizabethtown facility that also uses reverse osmosis. Therefore, the estimated wastewater discharge rate is 6,255 tons per year. The sludge generation ratio is 1:1.79.

- Based on a press release issued by the CDR, Elizabethtown facility it is estimated that, with the newly installed reverse osmosis system operating, the facility will discharge 49,467 tons of wastewater to the POTW per year. Sludge generation rates were estimated for this facility based on the sludge generation ratio at the Ciba Geigy, St. Gabriel facility (1:1.79), because the facilities are assumed to operate similar treatment systems. The estimated annual sludge generated by the CDR Elizabethtown facility is 27,635 tons.

EPA believes that very few facilities generate still bottoms or heavy ends from the production of triarylmethane dyes or pigments. BASF Corporation, in making a public comment regarding the original listing proposal, stated that they are the only facility remaining that produce triarylmethane dyes using aniline as a reactant.[60] Information obtained from the U.S. International Trade Commission in 1994 appears to confirm BASF's assertion. No literature was identified to estimate the waste generation to product production ratio for still bottoms. However Radian (1977) describes the manufacture of TAM dyes using aniline as a reactant.[61] The limited information obtained from this report indicates that in excess of five parts of aniline are used in conversion of one part of TAM dye; it is assumed that still bottoms will be equivalent to approximately five percent of the aniline used. This results in a still bottom generation ratio of 0.00013 tons of waste per pound of product.

---

[60] Buller, Manfred, BASF Corporation, letter to RCRA Docket Information Center, U.S. Environmental Protection Agency regarding "RCRA Docket Number F-94-DPLP-FFFFF EPA Proposed Rule on Identification and Listing of Hazardous Waste for the Dye and Pigment Industries, January 20, 1997. DPLP-L0004.

[61] Radian Corp. 1977. Industrial Process Profiles for Environmental Use: Chapter 7 Organic Dyes and Pigments Industry. NTIS PB-281 479.

The quantity of solids generated by the following remaining waste streams are assumed to be very minor. Some of these waste types may be included in the estimated wastewater treatment sludge estimates. No information regarding the actual generation rates of these waste streams within the dye and pigment industry was found.

- Spent Catalysts
- Spent Adsorbent
- Equipment Cleaning Sludge
- Product Standardization Filter Cake, and
- Dust Collector Filter Fines

Several limitations were encountered during the waste quantity determinations. Limited data regarding the facilities actual waste volumes were available. The specialty chemical industry consists of a wide range of manufacturing processes and plant sizes. Data available regarding the waste generation rates at specialty chemical facilities had very high standard deviations as noted above with the TSS values reported in the OCPSF Effluent Guidelines document. These high standard deviations and the high coefficients of variability indicate that the majority of the specialty chemical manufacturers are small plants and that a few plants are extremely large in comparison. This skewed data for wastewater generation and TSS influent values creates a potential to over estimate the wastewater and sludge generation rates at smaller producing facilities and a potential to under estimate the wastewater and sludge generation rates at large producing facilities.

4.4 Current (Baseline) Management Practices

This section presents the baseline management methods for the 37 dye and/or pigment manufacturing facilities operated by 29 companies and the 13 expanded scope facilities.

4.4.1 Dye, Pigment and FD&C Facility Baseline Management Practices

For the dye, pigment, and FD&C facilities, the baseline management methods were determined through review of industry and trade group comments regarding the previous proposed regulations, publicly available data, the 2000 Toxic Release Inventory (TRI) Report, and internet sources.

PCS data were used to identify facilities that have NPDES discharge permits. All other facilities are assumed to discharge to a POTW given they are not listed in the PCS database.

All management systems, except for “no treatment,” are assumed to generate sludge (i.e., nonwastewaters). Sludge generated by chemical or biological treatment is collected in a clarifier. Collected sludge will require dewatering for handling and disposal purposes. Baseline management practices for sludges may consist of off site disposal in an unregulated clay lined or unlined landfill, synthetic lined Subtitle D landfill, or a Subtitle C landfill (bulk or super sack).

According to the 1987 Development Document for Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatment Standards for the Organic Chemicals and the Plastics and Synthetic Fibers Point Source Category Report (OCPSF Effluent Guidelines), the most common wastewater treatment method is an activated sludge system (biological treatment). For all facilities without site-specific information, biological treatment of wastewater with off-site unregulated unlined/clay lined disposal of sludge is assumed.[62] Table 4-7 lists the baseline management methods for the 37 facilities.

Three facilities with site-specific information available pertaining to the wastewater management methods have been identified. These facilities reported reverse osmosis (two facilities) and air stripping with chemical precipitation (one facility). Five facilities reported management by "tanks." Facilities reporting management by "tanks" were assumed to use biological treatment in open air tanks. The remaining 29 facilities are assumed to manage wastewaters by biological treatment in open air tanks.

Two facilities report surface impoundment polishing prior to discharge. Eight facilities report direct discharge by a NPDES permit in the PCS database and one reports discharge to the local POTW. The remaining 28 facilities were assumed to discharge to the local POTW.

Three facilities with site-specific information available pertaining to sludge management methods have been identified. Two facilities report off-site Subtitle D landfill and one facility reports on-site Subtitle C incineration followed by on-site Subtitle C landfill. One facility does not generate sludge based on their reported wastewater management methods (no treatment). The remaining 33 facilities are assumed to manage sludge off site in unregulated clay-lined landfills as a conservative lowest cost option.[63]

4.4.2 Expanded Scope Facilities Baseline Management Practices

Baseline management practices for the expanded scope facilities are presented in Table 4-8. The EPA Identification Number for each expanded scope facility was looked up in the EPA Envirofacts database. If an EPA Identification Number was found, the facility was looked up in the EPA Hazardous Waste Report (Biennial Report) database to determine the hazardous wastes currently generated that most likely would contain the constituents o-anisidine, p-cresidine, and 2,4-dimethylaniline. The management practices reported for the wastes identified in the Biennial Report database were used as the baseline management practice in the cost impact analysis. The reported baseline management practices are primarily energy recovery/fuel blending and incineration.

---

62 Assumption results in a conservative incremental compliance cost impact estimate.

63 Actual disposal may be in a synthetic lined municipal or equivalent landfill.

If an EPA Identification Number was not found for a facility it was assumed that the facility is a Conditionally Exempt Small Quantity Generator (CESQG) because they are not required under RCRA regulations to obtain an EPA ID Number. If an EPA ID Number was found for the facility but the facility was not found in the EPA Biennial Report database it was assumed that the facility was either a small quantity generator (SQG) or CESQG because they are not required to complete a Biennial Report under RCRA regulations except by a few states. The baseline management practices for these facilities was assumed to be energy recovery/fuel blending or incineration because these are the common management practices reported by other expanded scope facilities that completed a Biennial Report.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities				
Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
Abbey Color, Inc., Philadelphia, PA	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
AC&S, Incorporated, Nitro, WV	Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines and PCS data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Apollo Colors, Rockdale, IL	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
BASF Corporation, Huntington, WV	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Bayer Corporation, Charleston, SC	Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Summary of Information on Onsite Management Units for Facilities Manufacturing Dyes and/or Pigments, table dated March 20, 2003.	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Berwind Group, West Point, PA (Colorcon)	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities				
Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
CDR Pigments and Dispersions, Cincinnati, OH (Flint Ink)	Holding Tank, Biological Treatment with Cover, POTW Discharge, Clarifier	Summary of Information on Onsite Management Units for Facilities Manufacturing Dyes and/or Pigments, table dated March 20, 2003.	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
CDR Pigments and Dispersions, Elizabethtown, KY (Flint Ink)	Reverse Osmosis, Chemical Precipitation, Liquid Granular Activated Carbon, POTW Discharge, Clarifier	CDR Announces Waste Minimization Plan, undated www.cdrpigments.com/cdr/cdrnews.nsf	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
CDR Pigments and Dispersions, Holland, MI (Flint Ink)	Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines and PCS data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Chemical Compounds, Inc., Newark, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Ciba Geigy Specialty Chemicals, St. Gabriel, LA (excludes Novartis)	Reverse Osmosis, Chemical Precipitation, Liquid Granular Activated Carbon, POTW Discharge, Clarifier	Ciba-Geigy Corporation, Textile Production Division, Letter Re: Re: Docket Number: F-94-DPLP-FFFFF, Comments on Proposed Listing as RCRA Hazardous Waste, Five Wastes Generated During Production of Dyes and 59 FR 66072, 12/22/94, dated December 13, 1995	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities				
Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
Clariant Corporation, Coventry, RI	Holding Tank, Biological Treatment (No Cover), Surface Impoundment with Aeration (including annual dredging), NPDES Discharge, Clarifier,	Summary of Information on Onsite Management Units for Facilities Manufacturing Dyes and/or Pigments, table dated March 20, 2003; PCS data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Clariant Corporation, Martin, SC	Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Summary of Information on Onsite Management Units for Facilities Manufacturing Dyes and/or Pigments, table dated March 20, 2003; PCS data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Daicolor-Pope, Inc, Patterson, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Dye Specialties, Jersey City, NJ This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Eastman Chemical, Kingsport, TN	Liquid Injection, Incinerator Onsite or Off site Liquid Incineration (with transportation and handling fees), Holding Tank.	Information received from ETAD in a meeting with EPA on December 5, 2002. .	Subtitle C landfill.	Toxics Release Inventory data for 2000.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities				
Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
Engelhard Corporation, Louisville, KY	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
European Color, PLC., Fall River, MA (EC Pigments, Roma Colour)	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Galaxie Chemical, Paterson, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Industrial Color Company, Inc., Joliet, IL	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Lobeco Products, Incorporated, Lobeco, SC	Biological Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines and PCS Data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities				
Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
Magruder Color Company, Cartaret, NJ (includes Uhlich)	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Magruder Color Company, Elizabeth, NJ (inlcudes Uhlich)	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Subtitle D Landfill	Joel Weissglass, Esq., Secretary and General Counsel, Magruder Color Company, Comments of Magruder Color Company, Inc. on the Notice of Proposed Rulemaking, Identification and Listing of Hazardous Wastes; Dye and Pigment Industries, 64 Fed. Reg. 40192, July 23, 1999, Docket Number P-99-DPIP-FFFFF., dated October 20, 1999.
Max Marx Color, Irvington, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Subtitle D Landfill	Walter Sichel, President Max Marx Color, Comments of Max Marx Color Corporation on the Notice of Proposed Rulemaking, Identification and Listing of Hazardous Wastes; Dye and Pigment Industries, 64 Fed. Reg. 40192, July 23, 1999, Docket Number F-99-DPIP-FFFFF., dated October 20, 1999.
Nation Ford Chemical Company, Fort Mill, SC	Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines and PCS Data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities

Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
Noveon Incorporated, Cincinati, OH (formerly Goodrich)	Air Stripping, Thermal off gas Treatment, POTW Discharge, Clarifier, Chemical Precipitation	State of Ohio, 1990 Permit	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Passaic Color and Chemical (Royce Associates, LP), Paterson, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Rose Color, Newark, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Sensient Technologies, St Louis, MO	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Sensient Technologies, Elmwood Park, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Sensient Technologies, South Plainfield, NJ	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.

Table 4-7. Baseline Wastewater and Nonwastewater Management Methods for Selected Organic Dye, Pigment, and FD&C Facilities				
Facility	Wastewater Disposal Method	References	Solids Disposal Method	References
Sun Chemical Corp, Rosebank, NY	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Sun Chemical Corp, Muskegon, MI	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Sun Chemical Corp, Cincinnati, OH	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Synalloy Corporation, Spartanburg, SC	Holding Tank, Biological Treatment (No Cover), Surface Impoundment with Aeration (including annual dredging), POTW Discharge, Clarifier,	Summary of Information on Onsite Management Units for Facilities Manufacturing Dyes and/or Pigments, table dated March 20, 2003.	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
United Color Manufacturing, Inc., Newton, PA	Holding Tank, Biological Treatment (No Cover), POTW Discharge, Clarifier	Generic assumption based on 1987 OCPSF Effluent Guidelines	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.
Yorkshire Chemical, Lowell, NC	Holding Tank, Biological Treatment (No Cover), NPDES Discharge, Clarifier	Summary of Information on Onsite Management Units for Facilities Manufacturing Dyes and/or Pigments, table dated March 20, 2003; PCS data	Unregulated Landfill (clay-lined)	Generic assumption applied for consistency with the risk assessment and for conservative low-cost baseline.

Table 4-8. Baseline and Compliance management Practices for Expanded Scope Facilities						
Facility[1]	EPA ID [2]	Constituents of Concern	Hazardous Waste Description [3]	Waste Quantity (tons/year)	Baseline Management	Compliance Management
ALFA AESAR Ward Hill, MA	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline
ATO TECH Rock Hill, SC	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline
B I CHEMICALS Montvale, NJ	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline
BAYER	Address not available to identify specific Bayer facility.	2,4-Dimethylaniline	—	—	—	—
BIDDLE SAWYER New York, NY	NJD986614717	2,4-Dimethyl aniline	No Biennial Report completed must be SQG or CESQG; assume organic waste form	Maximum SQG categorization amount is 13.2 tons of waste per year – assume half this amount (6.6 tons) as a proxy for waste containing benzaldehyde	Assume managed by either energy recovery or incineration	Same as Baseline

Table 4-8. Baseline and Compliance management Practices for Expanded Scope Facilities						
Facility[1]	EPA ID [2]	Constituents of Concern	Hazardous Waste Description [3]	Waste Quantity (tons/year)	Baseline Management	Compliance Management
CHEM SERVICE INC. West Chester, PA	None	2,4-dimethylaniline	No EPA ID number must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year – assume half this amount (0.7 tons) as a proxy for waste containing benzaldehyde	Assume managed by either energy recovery or incineration	Same as Baseline
ENGELHARD CORP Iselin, NJ	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline
FIRST CHEMICAL Pascagoula, MS	MSD033417031	2,4-Dimethylaniline	"Distillation bottoms from production of aniline", and "Picric slop"	4,493.5 tons of waste	Incineration - Liquids (3,039 tons), and Energy Recovery - Liquids (1,454.5 tons)	Same as Baseline
HOECHST D	Address not available to identify specific Hoechst facility.	2,4-Dimethylaniline	—	—	—	—
LONZA BAYPORT Pasadena, TX	TXD084970169	o-Anisidine	"Arylamides, acetoacetic, waste in organic solvents...process waste...arylides unit"	311.68 tons of waste	Energy Recovery - Liquids	Same as Baseline

Table 4-8. Baseline and Compliance management Practices for Expanded Scope Facilities						
Facility[1]	EPA ID [2]	Constituents of Concern	Hazardous Waste Description [3]	Waste Quantity (tons/year)	Baseline Management	Compliance Management
CHICAGO SPECIALTIES L.L.C. Chicago, IL	ILD981091291	p-Cresidine	No waste descriptions; have EPA waste codes indicating Cresol (p-Cresidine is a Cresol derivative)	1,708.74 tons of waste	Landfill (1,079 tons), Energy Recovery - Liquids (592.5 tons), Fuel Blending (31.1 tons), Transfer Facility Storage (6.14 tons), and Stabilization (0.47 tons)	Same as Baseline
CINCINNATI SPECIALTIES L.L.C. Cincinnati, OH	OHD004261301	p-Cresidine	"Waste mono-nitro para cresol generated from spill cleaning"	0.02 tons of waste	Management method not reported. Assume managed by either energy recovery or incineration.	Same as Baseline
MORTON INTL. INC. PATERSON FACILITY Paterson, NJ	NJD051274348	p-Cresidine	Unable to identify specific waste streams. Eleven waste streams reported that could contain constituent of concern.	Unable to determine quantity. (Generation total for 11 waste streams totals to 867.48 tons)	Fuel Blending (all wastes are shipped to fuel blending)	Same as Baseline

[1] Facilities reported constituents on an MSDS or chemical manufacturer lists.
[2] EPA identification number looked up in Envirofacts Database.
[3] Looked for management data in the 1999 Biennial Report database. If no wastes reported, then used 2001 Biennial Report database which is currently going through QA/QC. Selected waste stream that is most likely to contain constituent of concern. Otherwise searched 1997, 1995, 1993, 1991, and 1989 Biennial Report databases in that order.

4.5 Post-Rule (Compliance) Management Practices

Compliance waste management practices are developed to address the Subtitle C or contingent management requirements that the wastes may be subject to after listing, as proposed. For the selected facilities, the analysis assumes that existing wastewater treatment impoundments would be replaced by wastewater treatment tank systems (see section entitled: Surface Impoundment Cost Estimates). Compliance costs are estimated for management of wastewater treatment sludges and solids (all nonwastewaters) assuming disposal at an off-site Subtitle C incinerator to account for future costs under Land Disposal Restrictions (LDR) program, or contingent management in a Subtitle D municipal waste type landfill that has a composite liner (e.g., clay liner and synthetic liner). Table 4-9 summarizes baseline and compliance management practices.

For the expanded scope facilities the analysis assumes that the compliance management practices will be the same as baseline. The baseline management practices of energy recovery/fuel blending and incineration will meet universal treatment standards set for the list of constituents of concern.

Table 4-9. Summary of Compliance Waste Management Practices For Affected Organic Dye, Pigment and FD&C Facilities			
Waste	Baseline	Standard Listing Approach*	Agency Preferred Approach*
K181 Waste Solids	Unregulated (Clay-Lined) Landfill*	On- or Off-site Sub C incineration and Subtitle C landfill of ash (nonstabilized), all waste.	Off-Site Municipal Waste Type Landfill (Composite Lined) for all nonwastewaters containing CoCs at or above conditional (Table 2-1) loading limits but below the nonconditional (Table 2-2) loading limit for toluene-2,4-diamine. OR On- or Off-site Sub C incineration and Subtitle C landfill of ash for facilities with wastes at or above the nonconditional (Table 2-2) mass-loading limit for toluene-2,4-diamine.

* Used to derive high-end incremental compliance cost estimate.

** Sampling and analytical costs only included for facilities generating greater than 1,000 metric tons of nonwastewaters (K181) per year. Sampling and analysis conducted to determine if facility wastes are below the constituent-specific load-based risk standards. Facilities generating less than 1,000 metric tons per year are assumed to use operator knowledge of their processes to make this determination.

4.6 Baseline and Compliance Waste Management and Administrative and Sampling Costs

Landfill Costs

Costs for landfill disposal were developed from the Remedial Action Cost Engineering and Requirements (RACER)[64] cost estimating software, and the March 2000 Remediation Market Report Published by Chartwell (Chartwell). Costs in RACER are based on 2002 Environmental Cost Handling Options and Solutions (ECHOS) cost database. The RACER disposal cost for hazardous and nonhazardous wastes is presented as a 30 city average of major cities across the United States. Chartwell reports the average costs of Subtitle D commercial landfill by state. For the purposes of this analysis, the state averages were averaged for a national average cost of disposal. All costs were inflated to 2003 dollars for this estimate using the Consumer Price Index. Landfill costs for small quantity shipments (set at less than 10 tons) were estimated using jumbo sack disposal costs for dry sludges/solids (non pumpable) to account for higher costs associated with smaller shipments (i.e., less than full loads). No minimum charge is assumed for the disposal of waste in Subtitle D landfills as there is no regulation of non-hazardous waste storage times; therefore, each non-hazardous waste load will be a full 18-ton load.

Disposal of solid waste in unregulated unlined landfills was estimated using the Subtitle D landfill disposal unit cost. Fifty percent of the Subtitle D landfill cost ($21.30) was used as a proxy for unregulated clay-lined landfill disposal costs based on best engineering judgment assuming the composite liner and other Subtitle D requirements account for half the cost.

Table 4-10. Landfill Unit Costs
(dollars/ton)

Cost Element	Baseline (2003 dollars)	Source
Unregulated Clay-lined Landfill	$21.30	Best Engineering Judgement
Subtitle D Landfill	$42.60	Chartwell
Small Quantity Jumbo Sack Sludge Subtitle C Landfill (non-pumpable)	$363.1	RACER
Bulk Sludge Subtitle C Landfill (non-pumpable)	$227.9	RACER

64 Costs were developed from the Remedial Action Cost Engineering and Requirements (RACER) cost estimating software, published by Earth Tech, Inc., 2003. Costs in this software are based on 2003 Environmental Cost Handling Options and Solutions (ECHOS) cost database. The database is copyrighted by Talisman Partners, LTD, and ECHOS, LLC. The database incorporates cost data from the Environmental Remediation Cost Data - Assemblies, 9th Annual Edition, 2003, which is published by R.S. Means Company and Talisman Partners, LTD.

Incineration Costs

Costs for commercial incineration were developed from RACER and the Hazardous Waste Resource Center's January 2002 Incinerator and Landfill Cost Data survey[65] (HWRC). The HWRC data present the results of a survey of the Environmental Technology Council (ETC). All costs were inflated to 2003 dollars for this estimate using the Consumer Price Index. Incineration costs for shipment quantities less than ten tons were estimated using jumbo sack disposal costs and 55-gallon drum disposal costs for dry sludges/solids and pumpable sludges, respectively. Costs for small quantities of non-pumpable sludge was estimated using a 30 percent markup over the bulk incineration unit cost to account for additional handling costs. The markup for small quantities was approximated using the unit cost increase between jumbo sack and bulk Subtitle C landfill (approximately 37 percent).

On-site incineration (rotary kiln) costs were estimated using the workbook methodologies developed by industry experts.[66] On-site incineration costs were originally developed using these workbook methodologies utilizing 1994 input values (fuel, electricity, etc.). The costs were inflated from 1994 dollars to 2003 dollars using the Chemical Engineering Plant Cost Index for capital costs and the Consumer Price Index for O&M costs.

On-site incineration costs do not include the cost of ash disposal. Ash generation is estimated to be 20 percent of the total mass incinerated and is disposed in a Subtitle C landfill.

---

65 Hazardous Waste Resource Center Http://www.etc.org/costsurvey6.cfm

66 Vogel, Gregory A., MITRE Corporation, *The Estimation of Hazardous Waste Incineration Costs*, sponsored by U.S. EPA, January, 1983, and K. Lim, R. DeRosier, R. Larkin, and R. McCormick, Acurex Corporation, Energy & Environmental Division, *Retrofit Cost Relationships for Hazardous Waste Incineration*, prepared for the U.S. EPA, Office of Research and Development, Industrial Environmental Research Laboratory, Incineration Research Branch, January, 1984.

Table 4-11. Incineration Unit Costs (dollars/ton)		
Cost Element	**Baseline (2003 dollars)**	**Source**
On-site Rotary Kiln Incineration of Non-pumpable Sludge	147.2 * (tons) + $927,503 = total dollars	Cost and Economic Impact Analysis of Listing Hazardous Wastes from the Organic Dye and Pigment Industries, prepared for the Office of Solid Waste Regulatory Analysis Branch USEPA by DPRA Incorporated, November 28, 1994
Off-site Bulk Incineration of Non-pumpable Sludge	$560.14	HWRC
Off-site Bulk Incineration of Pumpable Sludge	$1,033.2	HWRC
Off-site Small Quantity Incineration of Non-pumpable Sludge	$728.2	Assumed a 30 percent markup of off-site bulk incineration of non-pumpable sludge to reflect higher costs for smaller quantities
Off-site Bulk Incineration of Pumpable Sludge (drummed)	$1,947.5	HWRC

Dewatering

Costs for dewatering of pumpable sludges for disposal were developed using RACER and Documentation for Phase IV LDR Cost Equations Memo dated July 1997 (Phase IV LDR Memo). RACER unit costs were used for facilities generating less than 2,000 gallons per day (gpd) of wastewater. The technology assumed using RACER unit costs is a belt filter press with polymer addition. The Phase IV LDR Memo present curve fit costs for two system sizes range from 2,000 to 250,000 gpd and 250,000 to 5,200,000 gpd. The Phase IV LDR Memo dewatering technology is a centrifuge with a polymer feed system. The Phase IV LDR Memo cost curves were inflated from 1997 dollars to 2003 dollars using the Chemical Engineering Plant Cost Index for capital costs and the Consumer Price Index for O&M costs. All capital costs for both technologies were annualized over 15 years at a 7 percent CRF (0.1098).

Table 4-12. Dewatering Cost Curves (dollars/gallon wastewater)		
Cost Element	**Baseline (2003 dollars)**	**Source**
Belt Filter Press (systems sized less than 2,000 gpd)	0.0633 * (GPD) + 17,935 = total dollars	RACER
Centrifuge (systems sized 2,000 gpd to 250,000 gpd)	467.8 * (gpd)^0.5 + 38,560 = total dollars	Phase IV LDR Memo
Centrifuge (systems sized 250,000 gpd to 5,200,000 gpd)	0.62 * (gpd) +124,370 = total dollars	Phase IV LDR Memo

Transportation Costs

Hazardous waste transportation costs (excluding manifesting costs which are estimated separately) were estimated based on van trailer and roll-off bin trucking unit costs reported in RACER (Table 4-13). Costs are based on distance and maximum truck load size of 18 tons. An 18-ton limit is assumed as the maximum truck load size assumed in the RACER cost estimating software. Highways have a 40-ton gross weight limit for trucks, this includes the cab, trailer, and load. A minimum of four loads per year is assumed based on the maximum accumulation period of 90 days for hazardous waste disposal based on accumulation time regulations. Otherwise, the number of loads per year is calculated by dividing the total annual generation quantity by the assumed maximum truck load size of 18 tons. For smaller quantity generators (i.e., annual waste disposal below 40 tons per year), a truck load size of 5 tons was assumed (half our 10-ton small quantity designation discussed previously). The ECHOS minimum shipment fee of $730 is used to determine transportation unit costs below 200 miles for hazardous waste. For example, the transportation cost for shipping waste 100 miles is calculated by dividing the minimum shipment fee by 100 miles ($730/100 miles = $7.30/mile). Transportation costs are presented below. Table 4-14 presents how shipping distances vary when shipping to Subtitle C landfills (338 mile weighted average). The distances presented in the EPA, Evaluation of Cost and Economic Impacts of F006 Recycling Rulemaking Options from December 2001 for landfill disposal of electroplating wastes (based on a sample of 75 facilities) were utilized as a proxy for the transportation distances for sludge disposal.

Non-hazardous waste transportation costs (excluding manifesting costs) also were estimated based on bulk hazardous waste transportation costs reported in RACER. Costs are based on distance and a maximum load size of 18 tons. Due to the relatively close transportation distances estimated for Subtitle D landfills, a unit cost of $2.21 per mile ($0.12 per ton-mile) was used. The transportation cost is estimated to be less than the hazardous transportation unit cost due to the regularly scheduled, full 18-ton, bulk non-hazardous waste shipments. For non-hazardous waste and post rule product recycling, no minimum number of loads is assumed. The number of shipments per year is calculated by dividing the total annual generation quantity by the assumed maximum truck load size of 18 tons.

Table 4-13. Transportation Unit Costs [1]	
Cost Element	Baseline
Roll Off Bin (Bulk)	
Loading/Unloading	$2.60/ton
Hazardous Waste Minimum Charge	$730/shipment
Hazardous Waste Shipping:	
200-299 miles	$2.66/mile
300-399 miles	$2.41/mile
400-499 miles	$2.20/mile
500-599 miles	$2.10/mile
600-699 miles	$2.06/mile
700-799 miles	$1.98/mile
800-899 miles	$1.98/mile
900-999 miles	$1.98/mile
1,000+ miles	$1.94/mile
Non-Hazardous Waste	$2.21/mile
Van Trailer (Super Sack or Drums)	
Loading/Unloading	$2.60/ton
Hazardous Waste Minimum Charge	$760/shipment
Hazardous Waste Shipping:	
200-299 miles	$3.63/mile
300-399 miles	$3.35/mile
400-499 miles	$3.03/mile
500-599 miles	$2.88/mile
600-699 miles	$2.82/mile
700-799 miles	$2.71/mile
800-899 miles	$2.71/mile
900-999 miles	$2.71/mile
1,000+ miles	$2.63/mile

[1] Costs inflated from 2000 dollars to 2003 dollars for van-trailer costs and from 2002 to 2003 dollars for roll-off bin costs.

Weighted transportation costs are presented in Table 4-14 for transport to Subtitle C landfill. The weighted average transportation unit cost to Subtitle C landfill is $3.81/mile and the weighted average distance is 338 miles. The assumed average transportation unit cost to an incineration facility is $3.26/mile at an average distance of 577 miles. The assumed average transportation unit cost to a Subtitle D landfill is $2.21/mile and an average distance of 50 miles.

The estimates for Subtitle C landfill transportation distances were taken from the December 2001 F006 Recycling Rulemaking Options report, as indicated above. Table 4-14 reflects the distribution of distances that the top 75 electroplaters (in terms of generation quantity) are shipping their waste for disposal in Subtitle C landfills. These transportation distances for electroplaters are assumed to be similar to those that dye, pigment, and FD&C facilities are shipping their wastes.

Table 4-14. Weighted Average Transportation Unit Costs to Subtitle C Landfills [1]

Distribution Percentile (%)	Distance to Landfill (miles, n = 75)	Average Distance per 10th Percentile (miles)[2]	Weighted Distance to Subtitle C Landfill (miles)	Unit Price (dollars/mile)[3]	Weighted Unit Price (dollars/mile)
0	38	---	---	---	---
10	129	83.5	8.35	$8.75	$0.87
20	147	138	13.8	$5.29	$0.53
30	166	156.5	15.65	$4.67	$0.47
40	175	170.5	17.05	$4.28	$0.43
50	234	204.5	20.45	$2.66	$0.27
60	283	258.5	25.85	$2.66	$0.27
70	348	315.5	31.55	$2.41	$0.24
80	434	391	39.1	$2.41	$0.24
90	636	535	53.5	$2.10	$0.21
100	1627	1,131.5	113.15	$1.94	$0.19
Total			338.45		$3.81

[1] U.S. EPA, Evaluation of Cost and Economic Impacts of F006 Recycling Rulemaking Options, December 2001.
[2] Calculated by averaging distance to landfill for each 10th percentile. For example, the average distance for the 20th percentile (138 miles) is calculated by averaging 129 miles (distance at 10th percentile) and 147 miles (distance at 20th percentile).
[3] Costs inflated from 2000 dollars to 2003 dollars using the Consumer Price Index.

Manifesting Costs

In general, under the current hazardous waste regulations, wastes are tracked through the use of a hazardous waste manifest which accompanies each waste shipment. Manifesting costs were obtained from the Hazardous Waste Manifest Cost Benefit Analysis, prepared by Logistics Management Institute in October 2000. Costs were inflated to 2003 dollars using the Consumer

Price Index. The manifesting cost incurred by the generator per manifest was determined to be $89.31 for small quantity generators and $136.91 for large quantity generators. An average cost of $113.11 ($117.50 inflated to 2003 dollars) per manifest was assumed to be incurred by the generator. The transporter is assumed to incur $117.35 ($121.92 inflated to 2003 dollars) in manifesting costs per shipment. The transporter and generator costs were combined to estimate a total manifesting cost per shipment of $230.46 ($239 inflated to 2003 dollars).

Costs also have been estimated for shipping papers for non-hazardous wastes. Costs to prepare, carry, and retain shipping papers were obtained from the Hazardous Waste Manifest Cost Benefit Analysis. The cost for the generator to complete the shipping papers for each load is estimated to be $26.50, based on assumed effort of 0.5 hours by a technical staff member at $53 per hour.[67] The cost for the generator to maintain a copy of the disposal agreement is $2.70 per year. Assuming an average of four shipments per transporter per year, the cost per shipment for the generator to retain the reclamation agreement is approximately $0.68 per shipment. The cost for the transporter to record and carry the shipping papers and reclamation agreement is estimated at $58.53 per shipment. An additional $4.59 was assumed to be incurred by the transporter to retain the records for each generator. Assuming an average of four shipments per generator for each transporter a year, the cost per shipment for the transporter to retain the records for each generator is approximately $1.15. The transporter and generator costs were combined to estimate a total cost to prepare, carry and retain shipping papers of $86.86 ($90.40 inflated to 2003 dollars) per shipment.

Cost for disposal of wastes in unregulated or Subtitle D landfills include costs for shipping papers. All other methods of off-site disposal include costs for hazardous waste manifest.

RCRA Part B Permit

Costs for the RCRA Part B Permit were estimated using Estimated Costs for the Economic Benefits of RCRA Noncompliance dated September 1997. A Part B permit for general facility requirements and incinerator requirements were included for construction and operation of an on-site sludge rotary kiln. A cost of $43,693 ($51,924 inflated from 1997 to 2003 dollars using the Consumer Price Index) for the general facility requirements and $22,296 ($26,495 inflated from 1997 to 2003 dollars) for the incinerator requirements. Permit costs were annualized over 10 years at a 7 percent rate for borrowing capital (0.14238).

---

[67] Hourly rate from *Supporting Statement for Information Collection Request Number 801 "Modifications of the Hazardous Waste Manifest System – Proposed Rule"* July 19, 2000. [Note: Hourly rates for technical labor fall within a range depending upon geographic location, and source. The ICR uses a rate of $58.82, which is considered to be within the acceptable range.]

Sampling and Analytical

A list of individual constituents of concern (CoCs) were compared to the EPA Publication SW-846 to determine standard analytical methods available at commercial laboratories. Of the eight CoCs, four did not have standard methods listed in SW-846.

Table 4-15. Test Method List for Proposed Dye and Pigments CoCs Mass Loadings

Test Method	Description	Number of CoCs	CoCs[1]
8270	SVOCs	4	Aniline (8131) o-Anisidine 4-Chloroaniline (8131, 8410) p-Cresidine
–	No Method Identified	4	2,4-Dimethylaniline (2,4-xylidine) 1,2-Phenylenediamine 1,3-Phenylenediamine Toluene-2,4-diamine

[1] Additional analytical methods from SW-846 for the CoCs are listed next to the CoC in parentheses. Two CoCs are listed with multiple methods in the SW-846 document.

Pace Analytical Labs (Pace) was contacted to obtain vendor quotes for analytical testing of the CoC list. Pace did not identify any detection protocols in-place for the four CoCs without standard test methods. Pace contacted Labseek, an internet-based membership organization, to out source analytical testing and determine if other laboratories have protocols in-place for the detection of the four CoCs. An additional five laboratories were contacted by Labseek; none of which indicated they were capable of conducting analytical tests to detect the four CoCs.

For a lab to develop a protocol for an analytical process to detect the CoCs, an appropriate method must be identified.[68] The method is usually chosen by a regulatory body (e.g., state health department). A standard of a known concentration of the chemical is then purchased to use to calibrate and develop the identification protocol for a particular piece of equipment and consists of several runs of the analytic process. The laboratory is then certified by a regulatory agency for the particular chemical and method. The establishment of the analytical process is also dependant on the media; that is, a process must be developed for liquids and solids.

Each analytical test usually includes a list of chemicals identified in the process under a single method. A request for a single chemical on the test list generally will cost the same as running the entire list of chemicals. Therefore, to identify the entire list of CoCs, a minimum of three analytical tests (one known method and two new methods) will be required.

[68] Communication with Kari Hermansen, Pace Analytical, May 15, 2003.
Identified as "New Method" A and B in this report.

Table 4-16. Test Method List for Proposed Dye and Pigments CoCs Mass Loadings			
Test Method	Description	Number of CoCs	CoCs[1]
8270	SVOCs	4	Aniline (8131) o-Anisidine 4-Chloroaniline (8131, 8410) p-Cresidine
New Method A	No Method Identified	3	1,2-Phenylenediamine 1,3-Phenylenediamine Toluene-2,4-diamine
New Method B	No Method Identified	1	2,4-Dimethylaniline (2,4-xylidine)

Cost for sampling and analytical needs were estimated using Proposed Listing for Paint Manufacturing Wastes Public Comments Summary and Response Document, prepared by DPRA, October 30, 2001, and RACER. The annual cost for sampling and analysis of a non-aqueous waste streams (i.e., nonwastewaters) for the various scenarios are shown in Table 4-17.

Table 4-17. Analytical Unit Cost (dollars/sample)		
Method	Unit Cost Per Sample	Cost Source
Aqueous SVOC (EPA 625)	$533.46	2003 Racer
Non Aqueous SVOCs Method 8270	$413	2003 Racer
New Methods (Constituents groups not listed in EPA Document SW-846)	$337.85	Proposed Listing for Paint Manufacturing Wastes Public Comments Summary and Response Document, prepared by DPRA, October 30, 2001. Acrylamide was used as a proxy for a new constituent group Inflated from 2001$ to 2003$ using CPI.
Feasibility Study (per each media and analytical method)	$1,559	Proposed Listing for Paint Manufacturing Wastes Public Comments Summary and Response Document, prepared by DPRA, October 30, 2001. Acrylamide was used as a proxy for a new constituent group Inflated from 2001$ to 2003$ using CPI.

The cost estimate for dye, pigment and FD&C facilities includes costs for sample collection, development of procedure, feasibility studies, five annual samples of each analysis for mass loading determination, and 15 samples for initial characterization of newly listed wastes. The cost estimate for the expanded scope facilities does not include the 15 samples for initial characterization of newly listed wastes given their wastes containing CoCs already have been identified as either a characteristic or listed waste. Feasibility studies, procedure development, and characterization are annualized over five years at a 7.00 percent rate for borrowing capital (0.24389). A feasibility study is required for all CoCs without a prescribed method in the EPA document SW-846 at a estimated cost of $1,559. Four of eight CoCs do not have a EPA method. As laboratories do not perform analytical testing for the proposed CoCs, all methods will require procedure development (identified as New Method A and B in this report). Procedure development consists of performing the analysis 13 times (to develop calibration curves, identify spike and dilution rates, etc.). Three laboratories are assumed to develop methods and procedures for analysis of constituents without methods and procedures already established.

Table 4-18. Average Annualized Sampling and Analysis Costs Per Facility (dollars/year)[1]

Facilities	Dye and Pigment Industry Facilities Generating >1,000 Metric Tons and (CoC Containing Wastes for all 37 D&P Facilities)		Dye and Pigment Industry Facilities Generating >1,000 Metric Tons and (CoC Containing Wastes for 16 Identified D&P Facilities)	
	High Sludge Volume Estimate	Low Sludge Volume Estimate	High Sludge Volume Estimate	Low Sludge Volume Estimate
Dyes and Pigment Industries	$10,509	$10,688	$10,707	$10,858
Expanded Scope Facilities[2]	$2,117	$2,218	$2,149	$2,250

[1] Laboratory methodology development costs are spread across dye and pigment industry facilities generating more than 1,000 metric tons per year (11 facilities using high sludge volume estimates and 6 facilities using low sludge volume estimates) and 13 expanded scope facilities assuming that laboratories pass costs to generators. Analytical costs for dye and pigment industry facilities that were identified as generating waste containing a CoC and more that 1,000 metric tons per year (9 facilities using high sludge volume estimates and 5 facilities using low sludge volume estimates) were also determined. The 13 expanded scope facilities are further divided by the constituents of concern present in waste generated. Nine facilities generate waste containing 2,4-dimethylaniline, one facility generates waste containing o-anisidine and three facilities generate waste containing p-cresidine.

[2] Expanded scope facility annual cost is an average of the two methods development and sampling costs used to sample the three constituents.

For example, the annualized initial characterization cost is calculated as follows:

15 samples * ($413 + $338 + $338) * 0.24389 CRF = $3,984/year

An example annualized feasibility study and development cost for the analytical development costs (for all facilities generating more than 1,000 metric tons) is calculated as follows:

Method 8270: ((($0 Feasibility Study * 4 CoCs) + 13 runs * ($413)) * 0.24389 CRF)/(11 facilities generating more than 1,000 metric tons + 4 expanded scope facilities) * 3 laboratories developing analytical methods = $262/year.

New Method A: ((($1,559 Feasibility Study * 3 CoCs) + 13 runs * ($338)) * 0.24389 CRF)/(11 facilities generating more than 1,000 metric tons + 0 expanded scope facilities) * 3 laboratories developing analytical methods = $603/year.

New Method B: ((($1,559 Feasibility Study * 1 CoCs) + 13 runs * ($338)) * 0.24389 CRF)/(11 facilities generating more than 1,000 metric tons + 9 expanded scope facilities) * 3 laboratories developing analytical methods = $218/year.

Annual analytical costs include new methods A and B and method 8270. An example calculation of the annual sampling costs are as follows:

Dye and pigment facilities: 5 samples * ($413 + $338 + $338) = $5,445/year

Thirteen expanded scope facilities manufacture or use o-anisidine, p-cresidine, and 2,4-dimethylaniline. Each expanded scope facility generate waste with only one of the CoCs o-anisidine, p-cresidine, or 2,4-dimethylaniline. Expanded scope facilities only shared in the costs for developing methods (feasibility and calibration studies) for new method B.

Annualized sampling and analysis costs are dependant upon the number of facilities that will share the development costs. The greater the number of facilities that fall under the proposed ruling, the lower the cost for the method development. Expanded scope facilities do not include the cost for initial characterization as the wastes are already managed for other hazardous constituents and would have been characterized already.

Example calculations for the total annual sampling and analytical costs for the dye and pigment facilities and expanded scope facilities are as follows:

Dye and pigment facilities: $3,983/year characterization + $262/year Method 8270 development + $603/year new method A development + $218/year new method B development + $5,445/year annual sampling = $10,511/year (different from result of $10,509/year in Table 4-18 due to rounding)

Expanded scope facilities: ($262 Method 8270 + $218/year new method B development + (5 samples * ($413 + $338)) / 2 methods to average annual sampling costs = $2,117/year average

Administrative Costs

Cost for administrative duties were derived using hour estimates for each administrative task based on "best engineering judgement." The labor rates are from the U.S. Department of Labor Statistics, "National Compensation Survey: Occupational Wages in the United States, 1997; inflated using the Consumer Price Index to 2003 dollars. Administrative costs are estimated at $1,944. Administrative costs are assumed for all facilities managing dyes and/or pigments wastes as hazardous (traditional listing option). Facilities managing dyes and/or pigments waste as nonhazardous would incur costs for preparing an exclusion report.[69] An exclusion report consists of 6 hours of staff engineer labor ($96.43 per hour) and 2 hours of clerical labor ($47.58 per hour). An exclusion report is assumed to be required every 3 years; therefore the estimated cost of $674 was annualized 3 years at a 7 percent rate of borrowing for capital (0.38105) for an annual cost of $257.

Surface Impoundment Cost Estimates

Two potentially affected facilities (Synalloy, Spartanburg, SC and Clariant, Coventry, RI) have existing surface impoundments that do not meet the Subtitle C surface impoundment minimum technological requirements. The sludge from similar facilities is normally cleaned out on an annual basis. Under a post-listing scenario, the annual generation of sludge from these facilities may exceed acceptable loading levels. We have assumed that these facilities will determine that waste from these units would become listed and therefore choose to close and replace the units prior to the effective date of the final rule. The affected facilities are assumed to replace their impoundment with a tank rather than construct a Subtitle C impoundment. Costs associated with closure of the existing impoundment include the following: discharge of the wastewater to a POTW, removal and disposal of the sludge[70] at a Subtitle D landfill, and removal and disposal of

---

69 The "exclusion report" only applies to the agency preferred option. We have assumed that facilities who could declare their wastes to be nonhazardous because they would not meet the loading level would complete this report to acknowledge (declare) that determination. [Note: This may not be a requirement under the Agency Preferred Approach but is included in an effort to capture all potential costs.]

70 Surface impoundment sludge generally cleaned out once per year. Quantity removed and disposed based on assumption of “average” annual quantity, or 50 percent of the annual sludge generation at

two feet of contaminated soil. Sludge and contaminated soil is assumed to be shipped off-site to the appropriate management method.

Table 4-19. Surface Impoundment Management Cost Equations	
Activity	**Unit Cost or Cost Equation** (2003 dollars)
Treatment in unlined impoundment	Unlined impoundment: [1,2,3] $Y = 0.662 * X^{0.5861}$ (construction costs) Y = \$21.817 * Z + \$2,995.9 (dredging/disposal costs) Y = annualized cost/year X = gallons of wastewater/yr Z = tons/yr (assumes 4.7% of total sludge generation is collected in SI)
Close unlined impoundment and replace impoundment with tank and remove sludge annually	Close unlined impoundment with sludge removal and backfill of unlined impoundment (assumes 4.7% of total sludge generation is collected in SI): [1,3,4] Y = \$2.8803 * Z + \$259.14 Tank system: [1] $Y = 0.1556 * X^{0.704}$ Y = annualized cost/year Z = ton/yr
[1] Capital costs annualized assuming a before-tax interest rate of seven percent over 20 years. [2] Capital costs for an unlined impoundment based on the Memorandum Re: Hazardous Waste Identification Rule for Process Wastes: Waste Management Cost Data, dated September 27, 1996. [3] Costs for tanks systems and dredging were estimated using RACER 2003 software. [4] Surface Impoundment is assumed to be closed prior to regulation and no RCRA closure activities will be required.	

the impoundment.

4.7 Corrective Action Compliance Costs

Incremental corrective action costs associated with unpermitted facilities include the cost to conduct a RCRA Facility Investigation (RFI), a Corrective Measures Study (CMS), and remediate solid waste management units (SWMUs) and areas of concern (AOCs). Under the Agency Preferred Approach, possibly one facility will seek a RCRA permit to operate an on-site incinerator if their wastes contain toluene-2,4-diamine at concentrations exceeding the nonconditional listing mass-loading listing level. Otherwise, no facility is expected to seek a RCRA permit that could possibly trigger corrective action. Corrective action costs are not realistically anticipated under the Agency Preferred Approach.

Under the Standard Listing Approach, some of the unpermitted facilities will be brought into the RCRA program if they seek a RCRA Part B permit for construction and operation of an on-site incinerator. RCRA corrective action is typically triggered by facilities seeking a RCRA permit. Under the Standard Listing Approach it is estimated that between four and eight of the 37 facilities will seek a RCRA permit to operate an on-site incinerator because it would be more economical than managing the newly listed waste in an off-site commercial incinerator. These facilities may incur corrective action costs. Potential corrective action costs were not estimated and are not included in this analysis.

5.0 COST AND ECONOMIC IMPACT ANALYSIS

The cost and economic impacts are presented in this chapter for the dyes and pigments industries, expanded scope industries, as well as the landfill industry. The first section of the chapter addresses the dyes and pigments cost impacts. The second section addresses the economic impacts to the dye, pigment and FD&C facilities. The third section addresses the economic impacts to the expanded scope facilities (i.e., non-dye, pigment, and FD&C facilities). The final section addresses landfill industry and other impacts.

5.1 Cost Impacts

Cost estimate results are presented in Table 5-1. Total baseline costs range from $10.5 to $16.2 million per year depending on the total suspended solids concentration in the wastewater and the number of facilities that generate wastes containing one or more of the eight constituents of concern (CoCs) listed in Table 2-1. Incremental cost impacts are presented below for various analytical scenarios under the Agency Preferred Approach and the traditional listing option. Under the Agency Preferred Approach, we assume that whenever possible, facilities will choose the least cost option of disposing of wastes in composite-lined MSW landfills. Therefore only those facilities generating nonwastewaters containing toluene-2,4-diamine at or above the mass-loading limit would be required to manage this waste as RCRA hazardous.

“Low” and “High” Most Likely Scenario cost estimates have been developed. The Low Most Likely Scenario only includes the 16 facilities identified as likely to have wastes containing one or more of the 8 CoCs. These are assumed to be above the conditional mass-loadings levels (Table 2-1), yet below the nonconditional listing mass-loading level for toluene-2,4-diamine (Table 2-2). Incremental compliance costs for the Low Most Likely Scenario of the Agency Preferred Approach range from $0.6 to $1.1 million per year.

The “High” Most Likely Scenario also includes only those 16 facilities identified as likely to have wastes containing one or more of the eight CoCs. However under this scenario, we focused on those facilities that would not be able to manage their wastes as nonhazardous because their wastes exceed the nonconditional (Table 2-2) level proposed for toluene-2,4-diamine. All other facilities would be able to choose the least cost option of disposing of wastes in composite-lined MSW landfills; facilities exceeding the nonconditional (Table 2-2) level for toluene-2,4-diamine would face the highest waste management costs. Five facilities were found to be marketing products that are derived from toluene-2,4-diamine and therefore may generate wastes containing this constituent (see Table 4-1). Our data about one of these facilities (Abbey Color), may reflect reformulating and repackaging activities rather than manufacturing. As a result, we eliminated this facility from the analysis. A second facility (Dye Specialties) was found to generate negligible quantities of potentially affected waste (Table 4-6) and thus not likely to ever exceed the mass-loading level for toluene-2,4-diamine. This facility was also removed from the analysis. The remaining three facilities (Bayer, Passaic, and Yorkshire) were assumed to generate wastes containing toluene-2,4-diamine above the nonconditional mass-loading limit.

Our analysis assumed the entire nonwastewater quantity for each of these facilities, as identified in Table 4-6, would be managed as RCRA hazardous waste (we did not account for lower costs associated with managing as nonhazardous the portion of the waste that does not exceed the mass-loading limit). Incremental compliance costs for the High Most Likely Scenario of the Agency Preferred Approach range from $2.2 to $3.4 million per year. Incremental compliance costs for the Standard Listing Approach range from $9.4 to $15.9 million per year assuming 16 facilities generate wastes containing CoCs.

"Low" and "High" Worse Case Scenario cost estimates also have been developed. The Low Worse Case Scenario assumes that all 37 facilities generate wastes containing CoCs above the conditional Mass-loadings levels (Table 2-1) and below the one nonconditional listing mass-loading level (Table 2-2). Incremental compliance costs for the Low Worse Case Scenario of the Agency Preferred Approach range from $1.4 to $2.1 million per year. The "High" Worse Case Scenario also assumes that all 37 facilities identified having wastes containing CoCs, are above the conditional loadings levels. However, three of these facilities (see discussion directly above) are assumed to have wastes above the one nonconditional listing mass-loading level (Table 2-2). Incremental compliance costs for the High Worse Case Scenario of the Agency Preferred Approach range from $2.9 to $4.3 million per year. Incremental compliance costs for the Standard Listing Approach range from $17.0 to $26.3 million per year assuming all 37 facilities generate wastes containing CoCs.

Table 5-1. Summary of Baseline, Compliance, and Incremental Costs for Management of K181 Waste (million dollars/year; 2003 dollars)				
Parameter	**Baseline**	**Standard Listing Approach***	**Agency Preferred Approach***	
			Low (Nonconditional mass-loading listing level not exceeded)	**High (Nonconditional mass-loading listing level exceeded for 3 facilities)**
Most Likely Scenario: Only Including 16 Facilities (14 Companies) Identified Generating Wastes likely to Contain Constituents of Concern				
Low - High Nonwastewater (K181) Generation Estimate	\$10.5 - \$11.2	\$19.9 - \$27.1	\$11.1 - \$12.3	\$12.6 - \$14.6
Incremental Cost Above Baseline**	---	**\$9.4 - \$15.9**	**\$0.6 - \$1.1**	**\$2.2 - \$3.4**
Worse Case Scenario: Including All 37 Facilities (29 Companies)				
Low - High Nonwastewater (K181) Generation Estimate	\$15.4 - \$16.2	\$32.4 - \$42.5	\$16.7 - \$18.2	\$18.3 - \$20.5
Incremental Cost Above Baseline**	---	**\$17.0 - \$26.3**	**\$1.4 - \$2.1**	**\$2.9 - \$4.3**

* Sampling and analytical costs only included for facilities generating greater than 1,000 metric tons of nonwastewaters (K181) per year. Sampling and analysis conducted to determine if facility wastes are below the constituent-specific load-based risk standards. Facilities generating less than 1,000 metric tons per year are assumed to use operator knowledge of their processes to make this determination.

** Incremental costs when added to Baseline costs may not add to Standard Listing and Agency Preferred Approach total costs due to rounding.

Table 5-2 presents the cost impact results for the expanded scope facilities we examined for this analysis. Out of the 13 expanded scope facilities identified, one was determined to be a "small business," based on the SBA employment threshold. All facilities were found to generate wastes containing only one constituent of concern (see Section 4.2.2). Nine facilities manufacture or use 2,4-dimethylaniline, one facility manufactures or used o-anisidine, and three facilities manufacture or use p-cresidine. No incremental compliance management costs are identified or assumed for these businesses. Incremental sampling and analysis costs are estimated at \$2,149 per facility per year. Table 5-2 also presents the percent of corporate sales impacts for businesses that manufacture or use 2,4-dimethylaniline, o-anisidine and p-cresidine. Percent of corporate sales impacts range from 0.00001 percent to 0.08 percent.

Assuming the high-end sampling and analysis cost estimate of $2,250 per facility (Table 4-18), aggregate annual incremental cost impacts for the expanded scope small businesses would be approximately $2,250 (one expanded scope small business identified). Under this assumption, impacts for all 13 expanded scope facilities would be about $29,250 per year.

Table 5-2. Summary of Percent of Corporate Sales Impacts for the Expanded Scope Facilities									
Facility[1]	**EPA ID** [2]	**Constituents of Concern**	**Hazardous Waste Description** [3]	**Waste Quantity (tons/year)**	**Baseline Management**	**Compliance Management**	**Incremental Compliance Costs ($/yr)** [4]	**Corporate Sales** [5]	**Percent of Corporate Sales**
ALFA AESAR Ward Hill, MA	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline	$2,149	$6,812,373,040	0.00003%
ATO TECH Rock Hill, SC	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline	$2,149	$5,212,880,673	0.00004%
B I CHEMICALS Montvale, NJ	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline	$2,149	$7,580,000,000	0.00003%
BAYER	Address not available to identify specific Bayer facility.	2,4-Dimethylaniline	—	—	—	—	—	—	—

Table 5-2. Summary of Percent of Corporate Sales Impacts for the Expanded Scope Facilities									
Facility[1]	**EPA ID [2]**	**Constituents of Concern**	**Hazardous Waste Description [3]**	**Waste Quantity (tons/year)**	**Baseline Management**	**Compliance Management**	**Incremental Compliance Costs ($/yr) [4]**	**Corporate Sales [5]**	**Percent of Corporate Sales**
BIDDLE SAWYER New York, NY	NJD986614717	2,4-Dimethyl aniline	No Biennial Report completed must be SQG or CESQG; assume organic waste form	Maximum SQG categorization amount is 13.2 tons of waste per year – assume half this amount (6.6 tons) as a proxy for waste containing benzaldehyde	Assume managed by either energy recovery or incineration	Same as Baseline	$2,149	$23,900,000,000 [6]	0.00001%
CHEM SERVICE INC. West Chester, PA	None	2,4-dimethylaniline	No EPA ID number must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year – assume half this amount (0.7 tons) as a proxy for waste containing benzaldehyde	Assume managed by either energy recovery or incineration	Same as Baseline	$2,149	$2,700,000	0.07959%
ENGELHARD CORP Iselin, NJ	None	2,4-Dimethylaniline	No EPA ID number; must be a CESQG or non-generator because they are not required to have an EPA ID; assume organic waste form	Maximum CESQG categorization amount is 1.3 tons of waste per year - assume half this amount (0.7 tons) as a proxy for waste containing 2,4-dimethylaniline.	Assume managed by either energy recovery or incineration.	Same as Baseline	$2,149	$3,753,571,000	0.00006%
FIRST CHEMICAL Pascagoula, MS	MSD033417031	2,4-Dimethylaniline	"Distillation bottoms from production of aniline", and "Picric slop"	4,493.5 tons of waste	Incineration - Liquids (3,039 tons), and Energy Recovery - Liquids (1,454.5 tons)	Same as Baseline	$2,149	$24,522,000,000	0.00001%

Table 5-2. Summary of Percent of Corporate Sales Impacts for the Expanded Scope Facilities									
Facility[1]	EPA ID [2]	Constituents of Concern	Hazardous Waste Description [3]	Waste Quantity (tons/year)	Baseline Management	Compliance Management	Incremental Compliance Costs ($/yr) [4]	Corporate Sales [5]	Percent of Corporate Sales
HOECHST D	Address not available to identify specific Hoechst facility.	2,4-Dimethylaniline	—	—	—	—	—	—	—
LONZA BAYPORT Pasadena, TX	TXD084970169	o-Anisidine	"Arylamides, acetoacetic, waste in organic solvents...process waste...arylides unit"	311.68 tons of waste	Energy Recovery - Liquids	Same as Baseline	$2,149	$2,540,000,000	0.00008%
CHICAGO SPECIALTIES L.L.C. Chicago, IL	ILD981091291	p-Cresidine	No waste descriptions; have EPA waste codes indicating Cresol (p-Cresidine is a Cresol derivative)	1,708.74 tons of waste	Landfill (1,079 tons), Energy Recovery - Liquids (592.5 tons), Fuel Blending (31.1 tons), Transfer Facility Storage (6.14 tons), and Stabilization (0.47 tons)	Same as Baseline	$2,149	$371,700,000	0.00058%
CINCINNATI SPECIALTIES L.L.C. Cincinnati, OH	OHD004261301	p-Cresidine	"Waste mono-nitro para cresol generated from spill cleaning"	0.02 tons of waste	Management method not reported. Assume managed by either energy recovery or incineration.	Same as Baseline	$2,149	$371,700,000	0.00058%
MORTON INTL. INC. PATERSON FACILITY Paterson, NJ	NJD051274348	p-Cresidine	Unable to identify specific waste streams. Eleven waste streams reported that could contain constituent of concern.	Unable to determine quantity. (Generation total for 11 waste streams totals to 867.48 tons)	Fuel Blending (all wastes are shipped to fuel blending)	Same as Baseline	$2,149	$5,727,000,000	0.00004%

Table 5-2. Summary of Percent of Corporate Sales Impacts for the Expanded Scope Facilities									
Facility[1]	**EPA ID** [2]	**Constituents of Concern**	**Hazardous Waste Description** [3]	**Waste Quantity (tons/year)**	**Baseline Management**	**Compliance Management**	**Incremental Compliance Costs ($/yr)** [4]	**Corporate Sales** [5]	**Percent of Corporate Sales**

[1] Facilities reported constituents on an MSDS or chemical manufacturer lists.
[2] EPA identification number looked up in Envirofacts Database.
[3] Looked for management data in the 1999 Biennial Report database. If no wastes reported, then used 2001 Biennial Report database which is currently going through QA/QC. Selected waste stream that is most likely to contain constituent of concern. Otherwise searched 1997, 1995, 1993, 1991, and 1989 Biennial Report databases in that order.
[4] Sampling and analytical costs estimated to be $2,149 per facility per year.
[5] Dun & Bradstreet. 2003. Market Spectrum Database.
[6] http://in.biz.yahoo.com/p/g/glax.bo.html

5.2 Economic Impacts on the Dyes, Pigments, and FD&C Industries

The organic dyes and pigments industries produce dyes and pigments for a wide variety of intermediate and end users, including food, drugs and cosmetics. A total of 37 facilities owned by 29 companies may be impacted by the proposed rulemaking. Table 5-3 presents summary information on these facilities and their corporate owners, including corporate and facility revenues and the sources of these estimates.

5.2.1 Methodology

An economic impact analysis of the proposed rulemaking was conducted by using the incremental management costs derived in Section 5.1 of this report in conjunction with estimated waste generation and production rates. Estimates were completed on a facility specific basis. Information regarding waste generation rates were derived from various sources as noted previously in Chapter 4. Estimates of dye and pigment production rates, and product sales were derived based on information provided in corporate websites, Dun and Bradstreet and various assumptions, due to a lack of facility-specific information. Only publicly available information was used to generate these estimates.

Waste Generation Rates and Waste Management Costs

Waste generation rates are variable in the dyes and pigments industries, depending on the product being manufactured. Because actual wastewater sludge generation rates are not known, two assumptions were utilized to estimate waste generation, resulting in a range of estimates.

As described in Chapter 4, annual wastewater treatment sludge generation rates were estimated for the 37 facilities based on two sources. Facility specific information was available for one facility that reported plans to install a reverse osmosis wastewater treatment system.[71] The wastewater treatment sludge generation rate for another facility that reported using reverse osmosis, was estimated based on the calculated generation ratio. Wastewater treatment sludge generation rates were estimated for the remaining 35 facilities based on data from the 1987 OCPSF Effluent Guidelines report.[72] Sludge generation rates were estimated using relatively lower TSS concentration represented by the median values from the OCPSF report and alternatively a high generation rate was used based on the mean TSS concentrations form the OCPSF report, as described in Chapter 4. Incremental waste management costs were then estimated for both waste generation assumptions, for each of the regulatory approaches.

---

71 CDR Pigments & Dispersions, "Waste Water Minimization Plant, CDR Announces Waste Minimization Plan," available through the Company News webpage link on the CDR website on September 9, 2003, (http://www.cdrpigments.com/cdr/cdrnews.nsf/f7ea35a045bb0ddf852564cf005d4418/d9c86ff581cec3fd85256560007356 92?OpenDocument)

72 U.S. EPA, 1987.

Estimates of cost impacts are presented based on both of these low and high sludge generation assumptions, resulting in a range of impact estimates.

Facility and Corporate Revenues

Like waste generation rates, product prices for individual dyes and pigments also are variable. For instance, data from the U.S. International Trade Commission in 2002 indicate that Direct Dyes were valued as a class at less than $3,100 per ton while Acid Dyes, for example were valued at over $9,000 per ton. Wide variations also are apparent with pigment product prices. Because of the substantial variation in product prices and the lack of knowledge regarding specific product production at each facility, cost impacts are presented as a percentage of both facility-level revenues from dye and pigment production, as well as Corporate revenues. The basis for the facility and corporate revenues are highlighted in Table 5-3.

Table 5-3. Estimated Corporate, and Dye and Pigment Revenues For the Affected Dye, Pigment and FD&C Facilities				
Company and Facility Location	**Total Corporate Annual Gross Revenues 2003 U.S. dollars**	**Source of Corporate Annual Gross Revenues**	**Estimated Total Annual Revenues from all Synthetic Organic Dye, Pigment and FD&C Production 2003 dollars**	**Source of Facility Revenues**
Abbey Color, Inc., Philadelphia, PA	$5,075,000	Dun & Bradstreet	$4,953,000	1/
AC&S, Incorporated, Nitro, WV	$10,150,000	Dun&Bradstreet	$9,906,000	1/
Apollo Colors, Rockdale, IL	$63,532,000	Freedonia *	$62,007,000	1/
BASF Corporation, Huntington, WV	$32,987,500,000	basf.com	$319,979,000	2/
Bayer Corporation, Charleston, SC	$30,824,550,000	bayer.com	$298,998,000	2/
Berwind Group, West Point, PA	$1,015,000,000	berwind.com	$9,846,000	2/
TOTAL - CDR Pigments and Dispersions 1.) Cincinnati, OH 2.) Elizabethtown, KY 3.) Holland, MI	$1,463,630,000	hoovers.com *	$248,817,000	3/
Chemical Compounds, Inc., Newark, NJ	$3,230,000	Freedonia *	$3,153,000	1/
Ciba Geigy Specialty Chemicals, St. Gabriel, LA	$13,605,089,000	cibasc.com	$131,969,000	2/
TOTAL - Clariant Corporation 1.) Coventry, RI 2.) Martin, SC	$6,810,650,000	clariant.com	$422,685,000	4/
Daicolor-Pope, Inc, Patterson, NJ	$1,349,507,000	www.asiaweek.com	$16,599,000	1/
Dye Specialties, Jersey City, NJ This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain.	$8,076,000	Freedonia *	$7,882,000	1/

Table 5-3. Estimated Corporate, and Dye and Pigment Revenues For the Affected Dye, Pigment and FD&C Facilities				
Company and Facility Location	**Total Corporate Annual Gross Revenues 2003 U.S. dollars**	**Source of Corporate Annual Gross Revenues**	**Estimated Total Annual Revenues from all Synthetic Organic Dye, Pigment and FD&C Production 2003 dollars**	**Source of Facility Revenues**
Eastman Chemical, Kingsport, TN	$5,481,000,000	www.eastman.com	$53,166,000	2/
Engelhard Corporation, Louisville, KY	$3,809,295,000	www.hoovers.com/	$133,325,000	5/
European Color, PLC., Fall River, MA	$69,272,000	www.ecplc.com	$67,609,000	1/
Galaxie Chemical, Paterson, NJ	$4,307,000	Freedonia *	$4,204,000	1/
Industrial Color Company, Inc., Joliet, IL	$5,384,000	Freedonia *	$5,255,000	1/
Lobeco Products, Incorporated, Lobeco, SC	$1,451,450,000	nufarm.com	$14,079,000	2/
TOTAL - Magruder Color Company 1.) Cartaret, NJ 2.) Elizabeth, NJ	$121,142,000	Freedonia *	$118,234,000	1/
Max Marx Color, Irvington, NJ	$6,461,000	Freedonia *	$6,306,000	1/
Nation Ford Chemical Company, Fort Mill, SC	$15,225,000	Dun & Bradstreet	$7,612,000	
Noveon Incorporated, Cincinnati, OH	$1,116,500,000	www.noveoninc.com	$955,142,000	6/
Passaic Color and Chemical, Paterson, NJ	$21,536,000	Freedonia *	$21,019,000	1/
Rose Color, Newark, NJ	$5,583,000	Dun and Bradstreet	$5,449,000	1/
TOTAL - Sensient Technologies Corp 1.) St. Louis, MO 2.) Elmwood Park, NJ 3.) South Plainfield, NJ	$954,100,000	www.forbes.com	$158,762,000	7/
TOTAL - Sun Chemical Corp	$8,245,214,000	www.dic.co.jp/eng/index.ht	$159,684,000	8/

Table 5-3. Estimated Corporate, and Dye and Pigment Revenues For the Affected Dye, Pigment and FD&C Facilities				
Company and Facility Location	**Total Corporate Annual Gross Revenues 2003 U.S. dollars**	**Source of Corporate Annual Gross Revenues**	**Estimated Total Annual Revenues from all Synthetic Organic Dye, Pigment and FD&C Production 2003 dollars**	**Source of Facility Revenues**
1.) Rosebank, NY 2.) Muskegon, MI 3.) Cincinnati, OH		ml		
Synalloy Corporation, Spartanburg, SC	$95,245,000	Synalloy 200110K *	$92,959,000	9/
United Color Manufacturing, Inc., Newton, PA	$2,154,000	Freedonia *	$2,102,000	10/
Yorkshire Chemical, Lowell, NC	$189,051,000	Wright Investor's Service *	$84,245,000	11/

* Adjusted to 2003 dollars using the GDP implicit price deflator; rounded to nearest $1,000
1/ Proportional estimate based on average percent for all small companies
2/ Proportional estimate based on average percent for all large companies
3/ Adjustment based on CDR as 17 percent of total revenue, or one of six Divisions.
4/ Proportional estimate based on total revenues
5/ Based on percent of total gross corporate revenues
6/ Adjusted based on assumption that vast majority of revenues are from dyes, pigments, and FD&C.
7/ Based on percent of U.S. revenues (52 percent) and percent of colors group (32 percent)
8/ Total revenues for Sun Chemical of $3 billion in 2002, seven Divisions, 14.3 percent of total
9/ Lower of: Total U.S. value of production * percent of total value (based on March 12, 02 analysis) or total gross revenues
10/ ETAD. Assumed 100 percent organic dyes.
11/ http://www.yorkshireamericas.com/InvestorRelations.html (total for Americas) (1 pound to 1.55 dollar)

Freedonia = The Freedonia Group, Inc., <u>Private Companies Report 1222, Dyes and Pigments</u>, January 2000.

5.2.2 Estimated Facility-Level Impact

To examine the potential cost impacts of the proposed rulemaking, baseline management costs were compared with compliance management costs for affected facilities. Table 5-4 presents an overview of the expected impacts associated with the two regulatory options, depicting impact averages and ranges of impacts experienced by individual facilities. Table 5-4 presents impacts for both high and low nonwastewater generation scenarios.

Table 5-5 presents estimated impacts as a percent of dye and pigment sales under the high nonwastewater generation scenario for the two regulatory approaches for the individual facilities. Table 5-6 presents estimated impacts as a percent of dye and pigment sales under the low nonwastewater generation scenario for the two regulatory approaches. For the Agency Preferred Approach, impacts at the facility-level under the high waste generation assumption range from an average of 0.03 to 0.11 percent of sales, depending on the extent to which the facilities have the constituents of concern in their nonwastewaters and the number of facilities which are assumed to generate waste volumes exceeding the mass-loading listing level. Under the high nonwastewater generation scenario all facilities are estimated to have impacts substantially less than 1.0 percent of sales, with the highest impact estimated at 0.67 percent of sales. Under the low nonwastewater generation scenario, these average impacts range from only 0.02 to 0.06 percent of sales, with a maximum impact of 0.49 percent of sales.

Impacts at the facility-level are considerably higher under the Standard Listing Approach. Impacts, assuming all facilities generate wastes with the constituents of concern, range from 0.62 percent under the low nonwastewater generation scenario to 1.19 percent of sales under the high waste generation scenario. The highest impact under this option is just over 9.8 percent of sales, with six facilities experiencing impacts in excess of 3.0 percent of sales.[73] However, if the waste listing is limited to the facilities that we have some data linking to the constituents of concern, only one facility has estimated impacts in excess of 3.0 percent of sales.

Facility level impacts are difficult to estimate because production and sales data are frequently not available, especially for companies where there are multiple facilities. Consequently, for dye, pigment, and FD&C colorant manufacturers with multiple facilities, cost impacts are aggregated over each company's entire dye, pigment and FD&C colorant manufacturing facilities. Furthermore, facility-level revenues may include revenues for products other than dyes, pigments and FD&C colorants, as the larger facilities frequently manufacture other chemical products.

---

[73] This assumes that all three CDR Pigments and Dispersions facilities, which collectively have average impacts of nearly 3.2 percent are each individually over 3.0 percent.

TABLE 5-4. SUMMARY OF FACILITY-LEVEL INCREMENTAL COST IMPACTS AS A PERCENT OF SALES FOR MANAGEMENT OF K181 WASTE				
Parameter		**Standard Listing Approach***	**Agency Preferred Approach***	
			Low (Nonconditional mass-loading listing levels not exceeded)	**High** (Nonconditional mass-loading listing levels exceeded for 3 facilities)
Most Likely Scenario: Only Including 16 Facilities (14 Companies) Identified Generating Wastes with Constituents of Concern				
Low Nonwastewater (K181) Generation Estimate	Range	0.00-5.76%	0.00-0.30%	0.00-0.49%
	Average	0.33%	0.02%	0.04%
High Nonwastewater (K181) Generation Estimate	Range	0.00-9.81%	0.00-0.54%	0.00-0.67%
	Average	0.55%	0.03%	0.08%
Worse Case Scenario: Including All 37 Facilities (29 Companies)				
Low Nonwastewater (K181) Generation Estimate	Range	0.00-5.76%	0.00-0.30%	0.00-0.49%
	Average	0.62%	0.04%	0.06%
High Nonwastewater (K181) Generation Estimate	Range	0.00-9.81%	0.00-0.54%	0.00-0.67%
	Average	1.19%	0.06%	0.11%

* Sampling and analytical costs only included for facilities generating greater than 1,000 metric tons of waste solids (K181) per year. Sampling and analysis conducted to determine if facility wastes are below the constituent-specific load-based risk standards. Facilities generating less than 1,000 metric tons per year are assumed to use operator knowledge of their processes to make this determination.

Table 5-5. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye & Pigment Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Abbey Color, Inc., Philadelphia, PA	0.01%	0.01%	0.01%	0.01%	0.41%	0.41%
AC&S, Incorporated, Nitro, WV	0.02%	0.00%	0.02%	0.00%	0.38%	0.00%
Apollo Colors, Rockdale, IL	0.02%	0.00%	0.02%	0.00%	0.51%	0.00%
BASF Corporation, Huntington, WV	0.09%	0.09%	0.09%	0.09%	0.96%	0.96%
Bayer Corporation, Charleston, SC	0.05%	0.05%	0.67%	0.67%	0.67%	0.67%
Berwind Group, West Point, PA	0.02%	0.00%	0.02%	0.00%	0.55%	0.00%
TOTAL - CDR Pigments and Dispersions 4/ 1.) Cincinnati, OH 2.) Elizabethtown, KY 3.) Holland, MI	0.32%	0.04%	0.32%	0.04%	3.23%	0.86%
Chemical Compounds, Inc., Newark, NJ	0.03%	0.00%	0.03%	0.00%	1.22%	0.00%
Ciba Geigy Specialty Chem., St. Gabriel, LA	0.07%	0.07%	0.07%	0.07%	1.19%	1.19%
TOTAL - Clariant Corporation 4/ 1.) Coventry, RI 2.) Martin, SC	0.07%	0.07%	0.07%	0.07%	0.83%	0.83%
Daicolor-Pope, Inc, Patterson, NJ	0.02%	0.00%	0.02%	0.00%	0.52%	0.00%
Dye Specialties, Jersey City, NJ This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain	0.00%	0.00%	0.00%	0.00%	0.02%	0.02%
Eastman Chemical, Kingsport, TN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 5-5. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye & Pigment Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Engelhard Corporation, Louisville, KY	0.07%	0.00%	0.07%	0.00%	1.13%	0.00%
European Color, PLC., Fall River, MA	0.03%	0.00%	0.03%	0.00%	0.66%	0.00%
Galaxie Chemical, Paterson, NJ	0.16%	0.00%	0.16%	0.00%	3.83%	0.00%
Industrial Color Company, Inc., Joliet, IL	0.03%	0.00%	0.03%	0.00%	0.67%	0.00%
Lobeco Products, Incorporated, Lobeco, SC	0.16%	0.00%	0.16%	0.00%	3.96%	0.00%

Table 5-5. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye & Pigment Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
TOTAL - Magruder Color Company 4/ 1.) Cartaret, NJ 2.) Elizabeth, NJ	0.02%	0.00%	0.02%	0.00%	0.38%	0.00%
Max Marx Color, Irvington, NJ	0.03%	0.00%	0.03%	0.00%	0.70%	0.00%
Nation Ford Chemical Co., Fort Mill, SC	0.54%	0.54%	0.54%	0.54%	9.81%	9.81%
Noveon Incorporated, Cincinnati, OH	0.01%	0.01%	0.01%	0.01%	0.13%	0.13%
Passaic Color and Chemical, Paterson, NJ	0.01%	0.01%	0.30%	0.30%	0.30%	0.30%
Rose Color, Newark, NJ	0.02%	0.00%	0.02%	0.00%	0.56%	0.00%
TOTAL - Sensient Technologies Corp 4/ 1.) St. Louis, MO 2.) Elmwood Park, NJ 3.) South Plainfield, NJ	0.01%	0.01%	0.01%	0.01%	0.24%	0.19%
TOTAL - Sun Chemical Corp 4/ 1.) Rosebank, NY 2.) Muskegon, MI 3.) Cincinnati, OH	0.02%	0.00%	0.02%	0.00%	0.40%	0.09%
Synalloy Corporation, Spartanburg, SC	0.02%	0.00%	0.02%	0.00%	0.17%	0.00%
United Color Manufacturing, Newton, PA	0.02%	0.00%	0.02%	0.00%	0.62%	0.00%
Yorkshire Chemical, Lowell, NC	0.02%	0.02%	0.42%	0.42%	0.42%	0.42%
Average	0.06%	0.03%	0.11%	0.08%	1.19%	0.55%

Table 5-5. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye & Pigment Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted

1/ Nonwastewater generation rates based on the high generation rate assumptions described in Chapter 4.
2/ Both the Agency Preferred Approach and the Standard Listing include a most likely scenario, wherein impacts are projected only for 16 facilities with known constituents of concern in their nonwastewater. The worst case scenario assumes that in fact all facilities will generate nonwastewater with the constituents of concern.
3/ Impact estimates are presented for the Agency Preferred Approach using two assumptions regarding mass-loadings. The low impact estimates assume that the mass-loading listing levels are not exceeded. The high impact estimates assume that the mass-loading listing levels are exceeded for 3 facilities.
4/ Impacts are presented on a company basis due to a lack of information regarding facility-level production volumes.

Table 5-6. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye and Pigment Sales, Low Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Abbey Color, Inc., Philadelphia, PA	0.01%	0.01%	0.01%	0.01%	0.16%	0.16%
AC&S, Incorporated, Nitro, WV	0.01%	0.00%	0.01%	0.00%	0.19%	0.00%
Apollo Colors, Rockdale, IL	0.01%	0.00%	0.01%	0.00%	0.17%	0.00%
BASF Corporation, Huntington, WV	0.03%	0.03%	0.03%	0.03%	0.51%	0.51%
Bayer Corporation, Charleston, SC	0.03%	0.03%	0.49%	0.49%	0.49%	0.49%
Berwind Group, West Point, PA	0.01%	0.00%	0.01%	0.00%	0.19%	0.00%
TOTAL - CDR Pigments and Dispersions 4/ 1.) Cincinnati, OH 2.) Elizabethtown, KY 3.) Holland, MI	0.29%	0.01%	0.29%	0.01%	2.72%	0.35%
Chemical Compounds, Inc., Newark, NJ	0.02%	0.00%	0.02%	0.00%	0.44%	0.00%
Ciba Geigy Specialty Chem., St. Gabriel, LA	0.07%	0.07%	0.07%	0.07%	1.19%	1.19%
TOTAL - Clariant Corporation 4/ 1.) Coventry, RI 2.) Martin, SC	0.05%	0.05%	0.05%	0.05%	0.53%	0.53%
Daicolor-Pope, Inc, Patterson, NJ	0.01%	0.00%	0.01%	0.00%	0.18%	0.00%
Dye Specialties, Jersey City, NJ This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eastman Chemical, Kingsport, TN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 5-6. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye and Pigment Sales, Low Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Engelhard Corporation, Louisville, KY	0.02%	0.00%	0.02%	0.00%	0.47%	0.00%
European Color, PLC., Fall River, MA	0.01%	0.00%	0.01%	0.00%	0.22%	0.00%
Galaxie Chemical, Paterson, NJ	0.05%	0.00%	0.05%	0.00%	1.27%	0.00%
Industrial Color Company, Inc., Joliet, IL	0.01%	0.00%	0.01%	0.00%	0.24%	0.00%
Lobeco Products, Incorporated, Lobeco, SC	0.08%	0.00%	0.08%	0.00%	1.91%	0.00%
TOTAL - Magruder Color Company 4/ 1.) Cartaret, NJ 2.) Elizabeth, NJ	0.01%	0.00%	0.01%	0.00%	0.13%	0.00%
Max Marx Color, Irvington, NJ	0.01%	0.00%	0.01%	0.00%	0.25%	0.00%
Nation Ford Chemical Co., Fort Mill, SC	0.30%	0.30%	0.30%	0.30%	5.76%	5.76%
Noveon Incorporated, Cincinnati, OH	0.00%	0.00%	0.00%	0.00%	0.04%	0.04%
Passaic Color and Chemical, Paterson, NJ	0.00%	0.00%	0.10%	0.10%	0.10%	0.10%
Rose Color, Newark, NJ	0.01%	0.00%	0.01%	0.00%	0.21%	0.00%
TOTAL - Sensient Technologies Corp 4/ 1.) St. Louis, MO 2.) Elmwood Park, NJ 3.) South Plainfield, NJ	0.00%	0.00%	0.00%	0.00%	0.08%	0.06%
TOTAL - Sun Chemical Corp 4/	0.01%	0.00%	0.01%	0.00%	0.13%	0.03%

Table 5-6. Estimated Facility-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Dye and Pigment Sales, Low Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
1.) Rosebank, NY 2.) Muskegon, MI 3.) Cincinnati, OH						
Synalloy Corporation, Spartanburg, SC	0.02%	0.00%	0.02%	0.00%	0.07%	0.00%
United Color Manufacturing, Newton, PA	0.02%	0.00%	0.02%	0.00%	0.26%	0.00%
Yorkshire Chemical, Lowell, NC	0.01%	0.01%	0.20%	0.20%	0.20%	0.20%
Average	0.04%	0.02%	0.06%	0.04%	0.62%	0.33%

1/ Nonwastewater generation rates based on the high generation rate assumptions described in Chapter 4.
2/ Both the Agency Preferred Approach and the Standard Listing include a most likely scenario, wherein impacts are projected only for 16 facilities with known constituents of concern in their nonwastewater. The worst case scenario assumes that in fact all facilities will generate nonwastewater with the constituents of concern.
3/ Impact estimates are presented for the Agency Preferred Approach using two assumptions regarding mass-loadings. The low impact estimates assume that the mass-loading listing levels are not exceeded. The high impact estimates assume that the mass-loading listing levels are exceeded for 3 facilities.
4/ Impacts are presented on a company basis due to a lack of information regarding facility-level production volumes.

5.2.3 Estimated Corporate-Level Impacts

To examine the potential economic impact of the proposed rulemaking on each of the corporate entities, the incremental regulatory costs are compared to gross annual corporate sales. Table 5-7 presents an overview of impacts for both high and low nonwastewater generation scenarios.

As Table 5-8 shows that average industry impacts are expected to range from 0.04 to 0.05 percent of corporate sales for all facilities under the Agency Preferred Approach under the high waste generation assumption. Average industry impacts of only 0.04 percent are expected for those facilities that are assumed to generate waste containing the constituents of concern and none of the facilities exceed the mass-loading listing level. Industry impacts are notably higher under the Standard Listing Approach, averaging 0.72 percent of corporate sales if all facilities generate nonwastewaters containing the constituents of concern. This average industry impact percentage drops to only 0.37 percent if only the facilities reporting constituents of concern are ultimately affected. Two companies exceed 3.0 percent of annual corporate sales with a high of nearly 9.6 percent using the high generation estimate for the Standard Listing Approach.

Table 5-9 presents impacts under the low waste generation assumption. Impacts are less under this assumption, with average industry impacts for the Agency Preferred Approach ranging from 0.01 percent to a high of 0.02 percent if all facilities generate wastes containing constituents of concern and the facilities exceed the mass-loading listing level. For the Agency Preferred Approach no company exceeds impacts of greater than 1.0 percent of corporate sales using low generation estimates. Under the Standard Listing Approach, average industry impacts are estimated to be 0.34 percent of corporate sales if all facilities generate wastes containing the constituents of concern. The average impact percentage drops to only 0.21 percent if only the facilities reporting constituents of concern are ultimately affected. For the Standard Listing Approach one company exceeds 3.0 percent (5.6 percent) of annual corporate sales using the low generation estimate.

TABLE 5-7. SUMMARY OF CORPORATE-LEVEL INCREMENTAL COST IMPACTS AS A PERCENT OF SALES FOR MANAGEMENT OF K181 WASTE

Parameter		Standard Listing Approach*	Agency Preferred Approach*	
			Low (Nonconditional mass-loading listing levels not exceeded)	High (Nonconditional mass-loading listing levels exceeded for 3 facilities)
Most Likely Scenario: Only Including 16 Facilities (14 Companies) Identified Generating Wastes with Constituents of Concern				
Low Nonwastewater (K181) Generation Estimate	Range	0.00-5.62%	0.00-0.29%	0.00-0.29%
	Average	0.21%	0.01%	0.02%
High Nonwastewater (K181) Generation Estimate	Range	0.00-9.57%	0.00-0.52%	0.00-0.52%
	Average	0.37%	0.02%	0.04%
Worse Case Scenario: Including All 37 Facilities (29 Companies)				
Low Nonwastewater (K181) Generation Estimate	Range	0.00-5.62%	0.00-0.29%	0.00-0.29%
	Average	0.34%	0.02%	0.02%
High Nonwastewater (K181) Generation Estimate	Range	0.00-9.57%	0.00-0.52%	0.00-0.52%
	Average	0.72%	0.03%	0.05%

* Sampling and analytical costs only included for facilities generating greater than 1,000 metric tons of waste solids (K181) per year. Sampling and analysis conducted to determine if facility wastes are below the constituent-specific load-based risk standards. Facilities generating less than 1,000 metric tons per year are assumed to use operator knowledge of their processes to make this determination.

Table 5-8. Estimated Corporate-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Abbey Color, Inc., Philadelphia, PA	0.01%	0.01%	0.01%	0.01%	0.40%	0.40%
AC&S, Incorporated, Nitro, WV	0.02%	0.00%	0.02%	0.00%	0.37%	0.00%
Apollo Colors, Rockdale, IL	0.02%	0.00%	0.02%	0.00%	0.50%	0.00%
BASF Corporation, Huntington, WV	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
Bayer Corporation, Charleston, SC	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
Berwind Group, West Point, PA	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
TOTAL - CDR Pigments and Dispersions 4/ 1.) Cincinnati, OH 2.) Elizabethtown, KY 3.) Holland, MI	0.05%	0.01%	0.05%	0.01%	0.55%	0.15%
Chemical Compounds, Inc., Newark, NJ	0.03%	0.00%	0.03%	0.00%	1.19%	0.00%
Ciba Geigy Specialty Chem., St. Gabriel, LA	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
TOTAL - Clariant Corporation 4/ 1.) Coventry, RI 2.) Martin, SC	0.00%	0.00%	0.00%	0.00%	0.05%	0.05%
Daicolor-Pope, Inc, Patterson, NJ	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
Dye Specialties, Jersey City, NJ This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain	0.00%	0.00%	0.00%	0.00%	0.02%	0.02%
Eastman Chemical, Kingsport, TN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 5-8. Estimated Corporate-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Engelhard Corporation, Louisville, KY	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%
European Color, PLC., Fall River, MA	0.03%	0.00%	0.03%	0.00%	0.65%	0.00%
Galaxie Chemical, Paterson, NJ	0.15%	0.00%	0.15%	0.00%	3.74%	0.00%
Industrial Color Company, Inc., Joliet, IL	0.03%	0.00%	0.03%	0.00%	0.66%	0.00%
Lobeco Products, Incorporated, Lobeco, SC	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%
TOTAL - Magruder Color Company 4/ 1.) Cartaret, NJ 2.) Elizabeth, NJ	0.02%	0.00%	0.02%	0.00%	0.37%	0.00%
Max Marx Color, Irvington, NJ	0.03%	0.00%	0.03%	0.00%	0.68%	0.00%
Nation Ford Chemical Co., Fort Mill, SC	0.52%	0.52%	0.52%	0.52%	9.57%	9.57%
Noveon Incorporated, Cincinnati, OH	0.01%	0.01%	0.01%	0.01%	0.11%	0.11%
Passaic Color and Chemical, Paterson, NJ	0.01%	0.01%	0.29%	0.29%	0.29%	0.29%
Rose Color, Newark, NJ	0.02%	0.00%	0.02%	0.00%	0.54%	0.00%
TOTAL - Sensient Technologies Corp 4/ 1.) St. Louis, MO 2.) Elmwood Park, NJ 3.) South Plainfield, NJ	0.00%	0.00%	0.00%	0.00%	0.04%	0.03%
TOTAL - Sun Chemical Corp 4/	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%

Table 5-8. Estimated Corporate-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Sales, High Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
1.) Rosebank, NY 2.) Muskegon, MI 3.) Cincinnati, OH						
Synalloy Corporation, Spartanburg, SC	0.02%	0.00%	0.02%	0.00%	0.17%	0.00%
United Color Manufacturing, Newton, PA	0.02%	0.00%	0.02%	0.00%	0.60%	0.00%
Yorkshire Chemical, Lowell, NC	0.01%	0.01%	0.19%	0.19%	0.19%	0.19%
Average	0.03%	0.02%	0.05%	0.04%	0.72%	0.37%

1/ Nonwastewater generation rates based on the high generation rate assumptions described in Chapter 4.
2/ Both the Agency Preferred Approach and the Standard Listing include a most likely scenario, wherein impacts are projected only for 16 facilities with known constituents of concern in their nonwastewater. The worst case scenario assumes that in fact all facilities will generate nonwastewater with the constituents of concern.
3/ Impact estimates are presented for the Agency Preferred Approach using two assumptions regarding mass-loadings. The low impact estimates assume that the mass-loading listing levels are not exceeded. The high impact estimates assume that the mass-loading listing levels are exceeded for 3 facilities.
4/ Impacts are presented on a company basis due to a lack of information regarding facility-level production volumes.

Table 5-9. Estimated Corporate-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Sales, Low Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Abbey Color, Inc., Philadelphia, PA	0.01%	0.01%	0.01%	0.01%	0.16%	0.16%
AC&S, Incorporated, Nitro, WV	0.01%	0.00%	0.01%	0.00%	0.19%	0.00%
Apollo Colors, Rockdale, IL	0.01%	0.00%	0.01%	0.00%	0.16%	0.00%
BASF Corporation, Huntington, WV	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bayer Corporation, Charleston, SC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Berwind Group, West Point, PA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
TOTAL - CDR Pigments and Dispersions 4/ 1.) Cincinnati, OH 2.) Elizabethtown, KY 3.) Holland, MI	0.05%	0.00%	0.05%	0.00%	0.46%	0.06%
Chemical Compounds, Inc., Newark, NJ	0.02%	0.00%	0.02%	0.00%	0.43%	0.00%
Ciba Geigy Specialty Chem., St. Gabriel, LA	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
TOTAL - Clariant Corporation 4/ 1.) Coventry, RI 2.) Martin, SC	0.00%	0.00%	0.00%	0.00%	0.03%	0.03%
Daicolor-Pope, Inc, Patterson, NJ	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dye Specialties, Jersey City, NJ This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eastman Chemical, Kingsport, TN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 5-9. Estimated Corporate-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Sales, Low Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
Engelhard Corporation, Louisville, KY	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%
European Color, PLC., Fall River, MA	0.01%	0.00%	0.01%	0.00%	0.21%	0.00%
Galaxie Chemical, Paterson, NJ	0.05%	0.00%	0.05%	0.00%	1.24%	0.00%
Industrial Color Company, Inc., Joliet, IL	0.01%	0.00%	0.01%	0.00%	0.24%	0.00%
Lobeco Products, Incorporated, Lobeco, SC	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%
TOTAL - Magruder Color Company 4/ 1.) Cartaret, NJ 2.) Elizabeth, NJ	0.01%	0.00%	0.01%	0.00%	0.12%	0.00%
Max Marx Color, Irvington, NJ	0.01%	0.00%	0.01%	0.00%	0.24%	0.00%
Nation Ford Chemical Co., Fort Mill, SC	0.29%	0.29%	0.29%	0.29%	5.62%	5.62%
Noveon Incorporated, Cincinnati, OH	0.00%	0.00%	0.00%	0.00%	0.04%	0.04%
Passaic Color and Chemical, Paterson, NJ	0.00%	0.00%	0.10%	0.10%	0.10%	0.10%
Rose Color, Newark, NJ	0.01%	0.00%	0.01%	0.00%	0.20%	0.00%
TOTAL - Sensient Technologies Corp 4/ 1.) St. Louis, MO 2.) Elmwood Park, NJ 3.) South Plainfield, NJ	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
TOTAL - Sun Chemical Corp 4/	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 5-9. Estimated Corporate-Level Impacts Presented as Incremental Regulatory Costs as a Percent of Sales, Low Sludge Generation Assumption 1/						
Company and Facility Location	Agency Preferred Approach 2/				Standard Listing Approach 2/	
	Low (Nonconditional mass-loading listing levels not exceeded) 3/		High (Nonconditional mass-loading listing levels exceeded for 3 facilities) 3/			
	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted	All Facilities Impacted	Only Known CoC Facilities Impacted
1.) Rosebank, NY 2.) Muskegon, MI 3.) Cincinnati, OH						
Synalloy Corporation, Spartanburg, SC	0.02%	0.00%	0.02%	0.00%	0.07%	0.00%
United Color Manufacturing, Newton, PA	0.02%	0.00%	0.02%	0.00%	0.26%	0.00%
Yorkshire Chemical, Lowell, NC	0.00%	0.00%	0.09%	0.09%	0.09%	0.09%
Average	0.02%	0.01%	0.02%	0.02%	0.34%	0.21%

1/ Nonwastewater generation rates based on the high generation rate assumptions described in Chapter 4.
2/ Both the Agency Preferred Approach and the Standard Listing include a most likely scenario, wherein impacts are projected only for 16 facilities with known constituents of concern in their nonwastewater. The worst case scenario assumes that in fact all facilities will generate nonwastewater with the constituents of concern.
3/ Impact estimates are presented for the Agency Preferred Approach using two assumptions regarding mass-loadings. The low impact estimates assume that the mass-loading listing levels are not exceeded. The high impact estimates assume that the mass-loading listing levels are exceeded for 3 facilities.
4/ Impacts are presented on a company basis due to a lack of information regarding facility-level production volumes.

5.2.4 Expanded Scope Impact Analysis

As previously noted, a total of 13 expanded scope facilities were identified. All facilities manufacture or use one constituent of concern. Nine facilities manufacture or use 2,4-dimethylaniline, one facility manufactures or uses o-anisidine, and three facilities manufacture or use p-cresidine. No incremental compliance waste management costs are identified or assumed to be necessary for the expanded scope facilities. We expect treatment already required for other organics in wastes generated by these facilities will be effective for treatment of the newly regulated organic constituents. Incremental annual sampling and analysis costs are anticipated at approximately $2,149 per constituent (or $2,149/facility/year). Percent of corporate sales impacts range from 0.00001 percent to 0.08 percent. Average impacts are estimated at 0.01 percent of sales for these companies. A listing of all expanded scope facilities potentially impacted is presented in Appendix B.

5.2.5 International Trade Impact Analysis

The dyes and pigments industries are international in scope, and many of the individual facilities potentially affected by this proposed rulemaking are owned by foreign firms with other facilities overseas. The proposed rule could increase the probability of curtailment of individual product lines, with the production being effectively transferred overseas. While this would serve to increase the U.S. trade deficit, the expected impact on trade will be negligible.

With higher levels of competition internationally, international trade in dyes and pigments from the U.S. industry's prospective has been increasingly unfavorable. Imports of foreign production have varied from approximately 100 to 112 thousand tons during the 1998 to 2002 period–with the highest level occurring in 2002. Export volumes have declined substantially since 2000, and in 2002 were only about 75 percent of recent high levels which occurred in 2000[74]. It is not clear whether these are long-term trends, which the listing of K181 may exacerbate, or simply a short-term market condition.

The ultimate impact on foreign trade will depend on the production decisions of individual producing companies. Potentially higher U.S. production costs resulting from the listing of K181 may increase foreign producers competitive advantage. However, because the impacts of the listing are relatively small–a maximum of $4.3 million under the Agency's preferred option–we do not see a potential for significant shifts in international trade resulting from this rulemaking.

---

74 USITC, 2003. General Customs Value for U.S. General Imports for NAICS 325132. Data compiled from USITC Interactive Tariff and Trade DataWeb. http://dataweb.usitc.gov/scripts/user_set.asp

5.2.6 Aggregate Price and Quantity Impacts

Under the economic assumption that the listing of K181 would result in some increase in dye, pigment and FD&C colorant production costs, the aggregate economic effect could be represented as an upward shift in the corresponding supply functions for these products, corresponding to the increase in cost of production. Given a downward sloping demand function, the post-listing equilibrium market price-quantity may be characterized by higher average prices and lower product output quantities. That is, both the price and quantity of product will likely be affected in the aggregate.

Estimating the potential changes in both quantities and prices is complicated by the fact that the changes in the market for dyes, pigments and FD&C colorants depend on the actual products affected. The dye, pigment and FD&C colorant markets are actually made up of many market segments, corresponding with different product characteristics and applications. Consequently estimating impacts based on industry averages may obscure the results for a particular dye, pigment and FD&C colorant product-application. Nevertheless, the analysis presented below helps to provide a range of potential impacts to the industry.

Cost impacts from the waste listing are estimated to range from approximately $0.6 to $4.3 million per year under the Agency's preferred listing option. With annual dye, pigment and FD&C colorant production in 2003 projected at 272,000 tons and the baseline average of $6,190 per ton, valued at nearly $1.7 billion,[75] this cost impact is equivalent to from $2.21 to $15.81 per ton or 0.04 to 0.26 percent of the total production value.

We assume that some portion of the cost impacts described above would be passed on to consumers in the form of higher prices (depending upon price elasticity of demand). The remaining portion would be absorbed by dye, pigment and FD&C colorant manufacturers in profit reductions. For purposes of establishing a range of impacts, we have examined two scenarios: 1) zero percent cost pass through, and 2) 100 percent cost pass through.

Under the zero cost pass through scenario, product prices charged but the producers would not change from the baseline average of $6,190 per ton of dye, pigment and FD&C colorant. Corresponding changes in market quantity would also be zero. Producers would absorb all production cost increases under this scenario, ultimately resulting in lower profits to producers. This impact scenario, summarized in Table 5-10 below, is not a likely outcome, However, this scenario helps to bound the potential price and quantity impacts.

---

[75] See Tables 3-1 and 3-8 for dye and pigment production estimates. Production is valued at prevailing 2002 prices, reported in Tables 3-2 and 3-9.

The second scenario, 100 percent cost pass through is also summarized in Table 5-10. In order to estimate the impacts on market quantities, we must estimate an elasticity of demand. The price elasticity of demand for dyes and pigments is reported to be approximately -1.5.[76] Consequently, the analysis of the 100 percent cost pass through is based on an elasticity of demand of -1.5.

Table 5-10. Potential Range of Aggregate Price and Quantity Impacts

Effect Measure	Zero Percent Cost Pass Through *	100 Percent Cost Pass Through **
Price Change		
Percentage	0.0%	0.04% - 0.26%
Dollars/ton	$0.00	$2.21 - $15.81
Quantity Change		
Percentage	0.0%	0.05% - 0.4%
Tons	0	146 - 1,142

* Assumes all costs are absorbed by the affected dye, pigment and FD&C colorant manufacturers
** Assumes all costs are passed on to consumers in the form of higher prices. Assumes a baseline average price of $6,190 per ton and production of 272,000 tons.

5.2.7 Employment Impacts

Because of the modest impacts associated with the proposed rule the Agency anticipates that there will be limited impacts on employment as a result of this rule. While some of the manufacturers who are impacted the most may in fact curtail production and lay off employees, this impact may be at least partially offset by increases in employment at hazardous waste management facilities.

5.2.8 Social Cost Impacts

Estimating actual social costs (changes in consumer and producer surplus) expected to result from this rule is made difficult by a lack of information on market supply and demand functions for the various products affected. Consequently this discussion focuses on who may be negatively and positively impacted by the rule.

---

76 U.S. Environmental Protection Agency. Economic Impact Analysis of Air Pollution Regulations: Organic Liquid Distribution. Prepared by the Research Triangle Institute. February 2002.

Positively Impacted Groups

- Dye, pigment and FD&C colorant manufacturers who are not affected by the rule may benefit from a more competitive position, not having to incur costs as a result of the rule.
- Hazardous waste facilities may benefit from increased demand for their services
- Depending on actual exposure patterns, population groups surrounding dye, pigment and FD&C colorant manufacturing facilities and unlined landfills may benefit from lower health risks due to more stringent management controls on these wastes.

Negatively Impacted Groups

- Dye, pigment and FD&C colorant manufacturers who would incur incremental compliance costs under the proposed rule.
- Dye, pigment and FD&C colorant consumers who may be affected by increasing prices.
- Municipal landfills who may need to comply with incremental leachate requirements.
- Facilities who generate wastes containing the expanded scope constituents of concern.

5.3 Other Impacts

<u>Landfills:</u>
As discussed in Chapter 4, the proposed waste listing may also result in impacts on land disposal facilities which have disposed of the wastes considered in this rulemaking. Because of the proposed listing, leachate from these landfills may be hazardous under the Derived-from Rule. Also, when the leachate from this waste mixes with leachate from other wastes disposed in these landfills the entire leachate quantity may be considered hazardous under the Mixture Rule. Accordingly there may be additional impacts on land disposal facilities from this proposed waste listing.

Cost impacts are expected to be less than those estimated in the proposed paint manufacturing hazardous waste listings given the dye, pigment, and FD&C industries generate less waste. For the proposed paint waste listings incremental costs expected to be incurred by the landfill industry were estimated to be approximately $300,000 to $400,000 annually for the Agency's proposed approach (which for leachate is the Clean Water Act Exemption with Two-Year Impoundment Replacement Deferral regulatory option).[77] However, the costs may be considerably lower as the result of possible savings gained through contract negotiations for repeat customers who provide consistent revenue streams to shipping companies through their regularly scheduled shipments of leachate. It also is likely

77 EPA, *Economic Assessment for the Proposed Concentration-Based Listing of Wastewaters and Non-wastewaters from the Production of Paints and Coatings*, Docket Number: F-2001-PMLP-FFFFF, January 19, 2001.

that not all landfills that received dye, pigment and FD&C wastes prior to this proposed action have leachate collection systems which will lower the cost estimates.[78]

<u>Remediation of Hazardous Waste Sites:</u>
Adding constituents to Appendix VIII, by itself, is not expected to have a significant impact on remediation of hazardous waste sites. The RCRA regulations in 40 CFR Part 264 establish management standards for hazardous waste treatment, storage and disposal facilities. Subpart F of 264 sets standards for addressing releases from solid waste management units. Appendix VIII is identified in section 264.93 of Subpart F as the list from which facility-specific groundwater protection standards are developed as part of a compliance monitoring program under 264.99. These ground-water protection standards are comprised of the Appendix VIII constituents that are "reasonably expected to be in or derived from waste contained in a regulated unit." The addition of these substances to Appendix VIII, therefore, would only potentially affect those facilities in compliance monitoring that (1) would reasonably be expected to use or make these chemicals, or (2) manage these wastes. Throughout the remainder of this Subpart, the Agency directs permit writers to Appendix IX, a list specifically designed to be used in monitoring groundwater. We are not proposing to add any constituents to Appendix IX.

We have addressed the potential impact of the first category of facilities (i.e., those that would reasonably be expected to use or make these chemicals, beyond the Dye and Pigment industries we evaluated) explicitly in our expanded scope analysis. For the second category of facilities, those that manage hazardous wastes that might contain the constituents being added to Appendix VIII, we believe these costs to be negligible. Our analysis indicates that these compounds are not widely used in commerce, and thus be unlikely to trigger the 264.93 standard of "reasonably expected to be in or derived from waste contained in a regulated unit" standard. Adding chemicals to Appendix VIII may also result in the remediation of these constituents at Superfund sites. However, for the same reasons noted above, we believe that the addition of these constituents to Appendix VIII will have a very limited impact (if any) on Superfund cleanups.

<u>Lead As A Potential K181 Constituent:</u>
We have considered whether a K181 lead standard may significantly change our assessment of the costs and economic impacts estimated for the Agency Preferred Approach. Our preliminary assessment indicates that there would be no substantive impacts. As described in Section 5.1, three facilities were found to generate wastes that may contain toluene-2,4-diamine. These three facilities were assumed to generate this constituent above nonconditional loading levels (Table 2-2) for our "high" analytical scenario under the Agency Preferred Approach (see Table 5-1). If we add lead as a K181 constituent, any of these facilities with lead in their wastes would need to stabilize post incineration residuals to comply with land disposal restrictions. Assuming all potentially affected waste is incinerated, the maximum aggregate incremental costs associated

[78] Note: Leachate must be collected and pumped to be "generated," resulting in creation of the newly listed derived-from waste. Landfills without leachate collection systems are unable to "generate" this new waste.

with stabilization, if required, are likely to be insignificant for these facilities on an individual basis, and minor in aggregate (Table 5-11).

Table 5-11. Maximum Potential Impacts of Adding Lead as a K181 Constituent: Agency Preferred Approach - High Cost Scenario

Facility	Maximum Affected Waste Quantity (U.S. Tons) [See Table 4-6]	Residual Quantity after Incineration (U.S. tons based on 25 percent residual after incineration)	Stabilization Cost (based on $203/ton)	Cost as a Percent of Gross Corporate Revenues (see Table 5-3)
Bayer	5,961	1,490	$302,470	0.001%
Passaic	98	25	$5,075	0.020%
Yorkshire	569	142	$28,826	0.020%
TOTAL	**6,628**	**1,657**	**$336,371** (8% - 15% of total costs)	**0.001%**

We also considered the potential impact of a K181 standard for lead for Eastman and Engelhard (Harshaw Chemical). Both of these facilities have reported significant quantities of lead in the Toxic Release Inventory (TRI). We believe that Eastman currently combusts it's commingled (largely non-dyes) wastes, and then manages the resultant residues in an onsite landfill. Based on available data, this landfill does not appear to meet the description of the exempt landfill cells, as detailed in the listing description (i.e., it is not a municipal solid waste landfill or a Subtitle C landfill). Eastman, therefore, may pursue one of a variety of actions. These include: segregating the wastes in the least costly manner feasible, eliminating the waste altogether, or sending all affected ash to a §258.40 compliant MSW landfill. Eastman also has a Subtitle C landfill onsite, which could be used for some or all of the incinerated waste of concern. We have not assessed cost impacts associated with these options. Based on 1999 Biennial Reporting data, Engelhard already manages the majority of their lead-bearing wastes as hazardous, while the remainder appears to go to a MSW landfill. We believe, therefore, that the Engelhard facility is not likely to incur any additional costs of concern.

6.0 QUALITATIVE BENEFITS

Possible human health and environmental benefits from the proposed rule are discussed qualitatively in this chapter. The proposed rule is intended to reduce the potential for environmental releases of constituents of concern at levels that may yield unacceptable risks. Depending on actual or future exposure patterns, the primary benefits of the proposed rule could include associated reductions in human health environmental effects from these releases. The proposed rule could also encourage greater waste minimization.

6.1 Sources of Benefits

The proposed rule is intended to reduce the potential for environmental releases of constituents of concern at levels that may yield unacceptable risks. The effect of listing wastes is to subject them to stringent management and treatment standards under the Resource Conservation and Recovery Act (RCRA) and to subject them to emergency notification requirements for releases of hazardous substances to the environment. Depending on actual or future exposure patterns, the primary benefits of the proposed rule could include associated reductions in human health environmental effects from these releases. Given the loadings-based approach to the proposed rule, we anticipate that dye, pigment and FD&C manufacturers may increase their waste minimization practices that eliminate, reduce, recycle, or reuse wastes containing these constituents creating a reduction in waste generation. Other sources of benefit come from changes in transportation practices and waste management practices. In addition, information on waste types, volumes, and constituents will be provided to public and governmental entities to provide better oversight, tracking and planning in the handling and management of these wastes.

6.2 Types of Benefits

6.2.1 Human Health Damages Avoided or Reduced

To the extent that the rule, as proposed, reduces actual or potential exposure to the constituents of concern, we expect that the proposed rule may yield benefits from changes in waste management.

In determining whether waste generated from the production of dyes and pigments meets the criteria for listing a waste as hazardous, we developed a preliminary list of constituents in three steps: first, out of the thousands of constituents that are used as ingredients in dyes and pigments, we identified a subset of potentially hazardous constituents used in dye and pigment formulations; second, we identified those constituents for which we have adequate data to complete a risk assessment so that we could develop a protective concentration level for the listing, if appropriate; finally, we ensured that test methods were available or could be developed so dye and pigment manufacturers would be able to identify the presence and concentration of constituents in their wastes, as necessary. The Agency examined the fate and mobility of these chemicals, plausible exposure routes, and current and plausible waste management practices. Based on this assessment of the wastes, a total of eight constituents, as presented in Table 6-1, were determined to pose unacceptable level of risk for human health and/or the environment depending on the actual levels of these constituents in the wastes, actual waste management practices, and actual or future exposure patterns. The risk assessment did not estimate population risks from current practices or the incremental risk reduction from future actions. As a result, we did not quantify or monetize benefits to human health. Details of the risk assessment approach and results are in the docket for the proposed rule.

Table 6-1. Constituents of Concern for Dyes and Pigments Proposed Waste Listing

Constituent	CAS
1,2-Phenylenediamine	95-54-5
1,3-Phenylenediamine	108-45-2
2,4-Dimethylaniline*	95-68-1
4-Chloroaniline	106-47-8
Aniline	62-53-3
o-Anisidine	90-04-0
p-Cresidine	120-71-8
Toluene-2,4-diamine	95-80-7

* Synonyms include 2,4-xylidine and 1-amino-2,4-dimethylbenzene.

6.2.2 Acute Events Avoided or Reduced

Acute events will be avoided or reduced from incidents of surface dumping resulting in groundwater, surface water, and soil contamination. Previously nonhazardous wastes will now be transported as hazardous waste if they meet the proposed load-based listing. Recordkeeping and manifest requirements will track these newly listed wastes as hazardous to assure proper shipment and management.

6.2.3 Resource Damages Avoided or Reduced

With changes in transportation, management, and recordkeeping resource damages will be avoided or reduced. Surface water, groundwater and land resources will be less likely damaged from spills associated with handling and transporting the waste and leachate from managing the waste. Cleanup requirements under RCRA will help restore any damaged resources. Benefits obtained from implementing these requirements include avoided or reduced resource damages to recreational and commercial activities (from reduced contamination of surface waters and reduced damage to biota and habitats) and negative esthetic impacts to commercial/industrial areas (e.g., creation of Brownfields). Proposed management requirements will help avoid future damages to drinking water and industrial use waters from dye, pigment and FD&C nonwastewaters.

6.2.4 Response Costs Avoided or Reduced

As a result of increased transportation and management requirements, response costs may be avoided or reduced. Response costs may be avoided or reduced for spill response actions, community participation, enforcement activities, remediation (corrective action), averted resource damages, and emergency response and planning (from waste information).

6.2.5 Waste Minimization

The loadings-based approach proposed in this action is designed, in part, to promote waste minimization practices. Unlike a concentration-based approach, facilities generating wastes containing constituents-of-concern must meet management requirements based on the total loading of the waste, regardless of the degree of assimilation with other wastes.

Regulatory compliance costs for the dyes and pigments industries may be lowered through use of waste minimization practices. A previously issued guidance document on pollution prevention, recycling, and reuse practices for the dye manufacturing industry[79] offers a number of general and specific alternatives.

While specific cost reductions are not available and tend to be highly dependent on the manufacturing processes at each facility, the following waste minimization opportunities for specific plant operations and waste streams may decrease compliance costs through reduction in waste volume at dye and pigment facilities.

> Filter Aid, Filter Bags, Filter Cloths: The method of filtration is critical in determining the amount of nonwastewater and wastewater produced by this process. Use of filter aids should be discouraged and filtering devices that use reusable membranes, filter cloths, or filter cartridges should be considered as alternatives. Centrifugation, while capital intensive, also may have application in reducing the amount of filtration and associated solid waste required.
>
> Dust and Fines: Dust and fines should be collected dry whenever practicable and returned to the product stream. Specifically designed enclosed rooms have proven effective for reducing the amount of dust reaching off-gas treatment.

---

[79] "Pollution Prevention Guidance Manual for the Dye Manufacturing Industry," Doc. No. EPA/741/B-92-001.

Automation and Computerization: Automated handling and measurement of raw materials and products has resulted in reduced spillage and lower concentrations of contaminants in wastewater. Fewer off-spec product batches are produced as well, thereby reducing the amount of solid waste leaving the facility. Computerized tracking of inventory, processing, and waste volumes results in fewer off-spec products and better tracking of the sources of wastewaters and nonwastewaters.

Process Integration, Product Scheduling, Dedicated Equipment: All waste streams should be viewed as potential raw materials for recycle to other parts of the same facility and also adjacent off-site facilities. Product scheduling should encourage long term planning and the development of sequencing strategies and analytical tools to minimize cross-contamination of equipment and products. Large batches of relatively few products made in dedicated equipment is ideal where practicable.

7.0 OTHER ADMINISTRATIVE REQUIREMENTS

This section describes the Agency's response to other rulemaking requirements established by statute and executive order, within the context of the proposed dye and pigment waste listing.

7.1 Environmental Justice

The Agency is committed to addressing environmental justice concerns and is assuming a leadership role in environmental justice initiatives to enhance environmental quality for all residents of the United States. The Agency's goals are to ensure that no segment of the population, regardless of race, color, national origin, or income bears disproportionately high and adverse human health and environmental impacts as a result of EPA's policies, programs, and activities, and that all people live in clean and sustainable[80] communities. In response to Executive Order 12898 and to concerns voiced by many groups outside the Agency, EPA's Office of Solid Waste and Emergency Response formed an Environmental Justice Task Force to analyze the array of environmental justice issues specific to waste programs and to develop an overall strategy to identify and address these issues (OSWER Directive No. 9200.3-17).

It is not certain whether the environmental problems addressed by the proposed dye and pigment waste listing could disproportionately affect minority or low income communities, due to the location of some dye and pigment manufacturing operations. These operations are distributed throughout the country and many are located within highly populated areas. Because the proposed rule increases requirements for dye and pigment manufacturers, this rule is intended to decrease risks from dye and pigment waste. It is, therefore, not expected to result in any disproportionately negative impacts on minority or low income communities relative to affluent or non-minority communities. Similarly, because the rulemaking is protective, it is intended to result in lower risk to minority or low-income workers handling the wastes in question relative to higher-wage or non-minority workers.

7.2 Unfunded Mandates Reform Act

Under Section 202 of the Unfunded Mandates Reform Act of 1995, signed into law on March 22, 1995, the Agency must prepare a statement to accompany any rule for which the estimated costs to state, local, or tribal governments in the aggregate, or to the private sector, will be $100 million or more in any one year. Under Section 205, the Agency must select the most cost-effective and least burdensome alternative that achieves the objective of the rule and is consistent with statutory requirements. Section 203 requires EPA to establish a plan for informing and advising any small governments that may be significantly affected by the rule.

An analysis of the costs and benefits of the proposed rule was conducted and it was determined

---

80 Sustainable refers to a principle which says that any development must not compromise the welfare of future generations for the benefit of present generations. This principle is designed to support intergenerational equity (i.e.; fairness between generations).

that this rule does not include a federal mandate that may result in estimated costs of $100 million or more to either state, local, or tribal governments in the aggregate. The private sector also is not expected to incur costs exceeding $100 million per year associated with this action.

7.3 Protection of Children from Environmental Health Risks and Safety Risks

On April 21, 1997, the President signed Executive Order 13045 entitled, "Protection of Children from Environmental Health Risks and Safety Risks." The Executive Order requires all economically significant rules[81] that concern an environmental health risk or safety risk that may disproportionately affect children to comply with requirements of the Executive Order. Because the Agency does not consider today's proposed rule to be economically significant, it is not subject to Executive Order 13045. Furthermore, today's proposed rule is intended to reduce potential releases of hazardous wastes to the environment. EPA considered risks to children in its risk assessment and set allowable concentrations for constituents in the waste at levels that are believed to be protective to children, as well as adults. Depending on current and future exposure patterns, any risks to children associated with such releases would also decrease. The management practices proposed in this rule, therefore, are intended to reduce the potential for unacceptable risks to children potentially exposed to the constituents of concern.

7.4 Regulatory Takings

The Agency has complied with Executive Order 12630, entitled Governmental Actions and Interference with Constitutionally Protected Property Rights (53 FR 8859, March 15, 1988), by examining the takings implications of this rule in accordance with the Attorney General's Supplemental Guidelines for the Evaluation of Risk and Avoidance of Unanticipated Takings issued under the Executive Order. The Agency has determined that this rule will not effect a substantial taking of private property or otherwise have taking implications under Executive Order 12630.

7.5 Federalism

Executive Order 13132, entitled "Federalism" (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" are defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

Under Section 6 of Executive Order 13132, EPA may not issue a regulation that has federalism

[81] An economically significant rule is defined by Executive Order 12866 as any rulemaking that has an annual effect on the economy of $100 million or more, or would adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health, or safety, or State, local, or tribal governments or communities.

implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

Section 4 of the Executive Order contains additional requirements for rules that preempt State or local law, even if those rules do not have federalism implications (i.e., the rules will not have substantial direct effects on the States, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government). Those requirements include providing all affected State and local officials notice, and an opportunity for appropriate participation in the development of the regulation. If the preemption is not based on expressed or implied statutory authority, EPA also must consult, to the extent practicable, with appropriate State and local officials regarding the conflict between State law and federally protected interests within the agency's area of regulatory responsibility.

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. This rule, as proposed, is projected to result in economic impacts to privately owned dye and pigment manufacturing facilities. Marginal administrative burden impacts may occur to selected States an/or EPA Regional Offices if these entities experience increased administrative needs, enforcement requirements, or voluntary information requests. However, this rule, as proposed, will not have substantial direct effects on the States, intergovernmental relationships, or the distribution of power and responsibilities. Thus, Executive Order 13132 does not apply to this rule.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, we specifically solicit comment on this proposed rule from State and local officials.

7.6 Tribalism

As of January 6, 2001, Executive Order 13175, Consultation and Coordination With Indian Tribal Governments, (65 FR 67249) took effect and revoked Executive Order 13084. This Order applies to regulations not specifically required by statute, that significantly or uniquely affect the communities of Indian tribal governments, and that impose substantial direct compliance costs on Indian tribal governments. If any rule is projected to result in significant direct costs to Indian tribal communities, EPA cannot issue this rule unless the Federal government provides funds necessary to pay the direct costs incurred by the Indian tribal government or the tribe, or consults with the appropriate tribal government officials early in the process of developing the proposed regulation. If EPA complies by consulting, we must provide the Office of Management and Budget (OMB) with all required information. We must also summarize, in a separately identified section of the preamble to the proposed or final rule, a description of the extent of our prior consultation with representatives of affected tribal governments, a summary of their concerns, and a statement supporting the need to issue the regulation. Also, Executive Order 13175 requires EPA to develop an effective process permitting elected and other representatives of Indian tribal governments to, "provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities."

Today's rule implements mandates specifically and explicitly set forth by the U.S. Congress without the exercise of any policy discretion by EPA. This action is proposed under the authority of Sections 3001 (b)(1), and 3001(e)(2) of the Hazardous and Solid Waste Amendments (HSWA) of 1984. These sections direct EPA to make a hazardous waste listing determination for "dye and pigment production wastes." Accordingly, the requirements of Executive Order 13175 do not apply to this rule.

Furthermore, today's proposal would not significantly or uniquely affect the communities of Indian tribal governments, nor would it impose substantial direct compliance costs on them. Tribal communities are not known to own or operate any dye and pigment manufacturing facilities, nor are these communities disproportionately located adjacent to or near such facilities. Finally, tribal governments will not be required to assume any administrative or permitting responsibilities associated with this proposed rule.

7.7 Regulatory Planning and Review

Executive Order 12866 (as amended by E.O. 13258) directs agencies to assess all costs and benefits of available regulatory alternatives and, if regulation is necessary, to select regulatory approaches that maximize net benefits (including potential economic, environmental, public health and safety effects, distributive impacts, and equity). A regulatory impact analysis (RIA) must be prepared for "economically significant" rules, which are defined in section 3(f)(1) of the order as rules that may "have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities." We have determined that the proposed rule is consistent with the principles set forth in the Order, and we find that the proposed rule would not have an effect on the economy that exceeds $100 million in any one year.

7.8 Energy Effects

On May 18 2001, the President signed Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use". This order ensures that agencies appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy. This rule is not expected to adversely affect energy supplies, distribution, or use and, therefore, no Statement of Energy Effects is required.

7.9 Improving Access to Services for Persons with Limited English Proficiency

Executive Order 13166, "Improving Access to Services for Persons with Limited English

Proficiency (LEP)," was signed by the President on August 11, 2000. The Executive Order requires Federal agencies to examine the services they provide, identify any need for services to those with limited English proficiency, and develop and implement a plan to provide those services so that LEP persons can have meaningful access to them. The Executive Order also requires Federal agencies work to ensure that recipients of Federal financial assistance provide meaningful access to their LEP applicants and beneficiaries. We have determined that the proposed rule is consistent with the principles set forth in the Order.

7.10 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 USC 601 et. seq, generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, a small entity is defined as: (1) a small business that is defined by the Small Business Administration by category of business using the North American Industrial Classification System (NAICS) and codified at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

We have identified a total of 37 organic dye, pigment, and FD&C facilities in operation in the U.S., which are owned by 29 different companies that are believed to be generating wastes of concern. Of these, 16 facilities are owned by 15 small companies. This determination is based on the Small Business Administration (SBA) definition of "small business" for these industries, defined as fewer than 750 employees at the corporate level.[82] A number of these companies are very small, with fewer than 50 total full-time employees. Of the 13 expanded scope companies, one was determined to be a small business.

The cost of compliance impacts for all small companies potentially affected by the rule were found to range from 0.00 percent to 0.52 percent of gross annual corporate revenues, depending

[82] "Table of Small Business Size Standards - Matched to North American Industrial Classification System (NAICS) Codes," revised May 5, 2003. Small Business Administration (SBA).

upon the level of nonwastewater quantities generated. The percent of annual corporate sales impact for the one expanded scope small business is estimated at 0.08 percent. A more comprehensive presentation of our small entity analysis si presented in the document: *Regulatory Flexibility Screening Analysis for the Proposed Loadings-Based Listing of Non-Wastewaters from the Production of Selected Organic Dyes, Pigments, and Food, Drug, and Cosmetic Colorants*, November 2003. This document is available in the public docket.

8.0 REFERENCES

Chemical Manufacturer and Product Database by ChemChannels.com.

Chemical Market Reporter. “Chemical Industry Shipments Could Reach $405 Billion.” December 22, 1997.

Chemical Week. “Pigments brighten; dyes fade.” July 25, 2001.

Cornell University, Department of Environmental Health and Safety, Material Safety Data Sheets database, http://msds.pdc.cornell.edu/msdssrch.asp

Department of Commerce, Census Bureau. 1997. Industrial Organic Chemicals, Manufacturers-Industry Series.

ETAD. December 15, 1995. Comments of the United States Dye Manufacturers Operating Committee of the Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers (ETAD). EPA Docket DPLP-00027.

Ink World. “The Organic Pigment Industry: Where its Been and Where its Going.” May 2003.

Kulkarni, S.V., C. D. Blackwell, A. L. Blackard, C. W. Stackhouse, and M. W. Alexander, U.S. Environmental Protection Agency, Air and Energy Engineering Research Laboratory," Project Summary Textile Dyes and Dyeing Equipment: Classification, Properties, and Environmental Aspects," EPA/600/S2-85/010, April 1985.

Office of Management and Budget. January 1996. Economic Analysis of Federal Regulations Under Executive Order12866. p. 3-5.

R.S. Means. 2002. Environmental Remediation Cost Data. 4th Annual Edition.

SRI International. “Chemical Economic Handbook Marketing Research Report - Dyes.” August, 2000.

SRI International. “Chemical Economic Handbook Marketing Research Report - Pigments.” May, 2001.

U.S. Department of Commerce. April 23, 2003. National Income and Product Accounts Tables: Gross Domestic Product Implicit Price Deflator. Bureau of Economic Analysis.

U.S. Department of Commerce. 1997. Synthetic Organic Dye and Pigment Manufacturing, Manufacturers-Industry Series, Census Bureau.

U.S. EPA. Economic Impact Analysis of Air Pollution Regulations: Organic Liquid Distribution. Prepared by the Research Triangle Institute. February 2002.

U.S. EPA 2001, 1999 and 1997 Hazardous Waste Report (Biennial Reports) databases.

U.S. EPA Toxics Release Inventory database

U.S. EPA. October 1987. Development Document for Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatment Standards for the Organic Chemicals and the Plastics and Synthetic Fibers Point Source Category Volume I. Industrial Technology Division, Office of Water Regulations and Standards.

U.S. EPA. Pollution Prevention Guidance Manual for the Dye Manufacturing Industry. Doc. No. EPA/741/B-92-001.

United States International Trade Commission. February 1997. Industry and Trade Summary Synthetic Organic Pigments. USITC Publication 3021.

United States International Trade Commission.1974. Synthetic Organic Chemicals, U.S. Production and Sales.

United States International Trade Commission. February 1993. Synthetic Organic Chemicals United States Production and Sales, 1991. USITC Publication 2607.

United States International Trade Commission. February 1994. Synthetic Organic Chemicals United States Production and Sales, 1992. USITC Publication 2607.

Unites States International Trade Commission. November 1994. Synthetic Organic Chemicals, U.S. Production and Sales. Publication 2810.

United States International Trade Commission. November 1995. Synthetic Organic Chemicals, Production and Sales. Publication 2933.

APPENDIX A

LIST OF POTENTIALLY IMPACTED DYE, PIGMENT AND FD&C FACILITIES

Table A-1. Final Facility List
U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*

Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
Abbey Color Incorporated [S]	400 East Tioga St. Philadelphia, PA 19134	1		x	
AC&S, Incorporated [S]	West 19th Street Par Industrial park Nitro, WV 25143	2		x[83]	
Apollo Colors [S]	1550 Mound Rd. Rockdale, IL 60436	3	x		
BASF Corporation	5th Ave, and 24th St. Huntington, WV 25722	4	x	x	
Bayer Corporation of US	Bushy Park Plant Dyes and Pigments Division P.O. Box 18088 Charleston, SC 29423	5	x	x	
Berwind Corporation (Common name in the U.S.: Colorcon)	415 Moyer Blvd. West Point, PA 19486	6			x

[83] This facility is included based on information provided by ETAD relative only to dye manufacturing.

Table A-1. Final Facility List
U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*

Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
CDR Pigments and Dispersions (Owned by Flint Ink, Inc.)	410 Glendale-Milford Rd. Cincinnati, OH 45215	7	x		
	305 Ring St. Elizabethtown, KY 42701	8	x		
	471 Howard Ave. Holland, MI 49423	9	x		
Chemical Compounds, Incorporated [S]	29 Riverside Ave 75 Newark, NJ 07104	10			x
Ciba-Geigy (Ciba Specialty Chemicals)	4200 Geigy Access Rd. St. Gabriel, LA 70776-0749	11		x	

Table A-1. Final Facility List
U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*

Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
Clariant Corporation	500 and 500-A Washington St. Coventry, RI 02816	12	x		
	Highway 102 788 Chert Quarry Rd Martin, SC 29836	13		x	
Daicolor-Pope, Inc. (Owned by: Dainichiseika Color & Chemicals Mfg. Co.,Ltd., Japan)	33 Sixth Ave. Paterson, NJ 07524	14	x		
Dye Specialties [S] (This facility appears to have ceased operations in mid 2003. The future status of this facility is uncertain)	P.O. Box 4130 407 Ege Ave. Jersey City, NJ 07304	15		x	
Eastman Chemical	P.O. Box 1974 Kingsport, TN 37662	16		x	
Engelhard Corporation	3400 Bank St. Louisville, KY 40212	17	x		
E.C. Pigments/European Color [S] (Common name in the U.S.: Roma Color)	749 Quequechan St. Fall River, MA 02723	18	x		

Table A-1. Final Facility List
U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*

Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
Galaxie Chemical [S]	26 Piercy Street Paterson, NJ 07544-0443	19	x		
Industrial Color Company, Inc. [S]	50 Industry Ave. Joliet, IL 60435	20	x		
Lobeco Products, Incorporated[84] [Parent company is Nufarm Limited]	23 John Meeks Way Lobeco, SC 29931	21		x	
Magruder Color Company [S]	48 Leffert St. Carteret, NJ 07008	22	x		
	1029 Newark Ave. Elizabeth, NJ 07208-0498	23	x		

84 This facility is included based on information provided by ETAD relative only to dye manufacturing.

Table A-1. Final Facility List
U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*

Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
Max Marx Color [S]	1200 Grove St. Irvington, NJ 07111 or, 192 Coit Street Irvington, NJ 07111	24	x		
Nation Ford Chemical Company [S]	2300 Banks Street P.O. Box 997 Fort Mill, SC 29716	25		x	
Noveon, Incorporated (Noveon Hilton-Davis)	2235 Langdon Farm Rd. Cincinnati, OH 45237-4790	26	x	x	x
Passaic Color and Chemical (Royce Associates, LP) [S]	28-36 Paterson Street Paterson, NJ 07501	27		x	
Rose Color [S]	170 Blanchard Newark, NJ 07105	28		x	

Table A-1. Final Facility List U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*					
Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
Sensient Colors, Inc. (Note: The Gilbraltar, PA facility is not included in this analysis. Dr. C.T. Helmes, Executive Director of ETAD North America has confirmed that this facility ceased all manufacturing as of August 2003.)	Baldwin Plant P.O. Box 14538 2526 Baldwin St. St. Louis, MO 63106	29		x	x
	16 Leliarts Lane Elmwood Park, NJ 07407	30		x	
	107 Wade Ave South Plainfield, NJ 07080	31			x

Table A-1. Final Facility List U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*					
Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
Sun Chemical Corp. (Most common name in the U.S. - The Colors Group) A wholly owned subsidiary of Dainippon Ink and Chemicals Incorporated (DIC) of Tokyo, Japan	441 Tompkins, Ave. Staten Island, NY 10305 (Rosebank, NY facility)	32	x		x
	4925 Evanston Ave. Muskegon, MI 49443	33	x		
	Facility location: 4526 Chickering Ave. Cincinnati, OH 45232	34	x		
Synalloy Corporation [S] (Blackman Uhler Chemical Co.)	P.O. Box 5627 2155 W. Croft Circle Spartanburg, SC 29304	35	x	x	
United Color Manufacturing, Inc. [S]	PO Box 480 Newtown, PA 18940	36		x	
Yorkshire Americas	P.O. Box 848 1602 Main St. Lowell, NC 28098	37		x	

Table A-1. Final Facility List U.S.-Based Dye, Pigment, and FD&C Colorant Manufacturing Facilities Believed to Generate Wastes of Concern*					
Company Name	Facility Address	Facility Count	Waste Source		
			Pigment Manufacturing	Dye Manufacturing	FD&C Manufacturing
	Total Number of Facilities =		37		
	Total Number of Companies =		29		
	Total Number of Small Companies =		15		

Notes

Note: No Confidential Business Information (CBI) sources were used in the development of this Table.

[S] = The company is a "small business," as defined by SBA employment standards (< 750 total employees at the corporate level).

ETAD = Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers.

IACM = International Association of Colorant Manufacturers.

CPMA = Color Pigments Manufacturers Association, Inc.

* The targeted wastes are from the manufacture of four classes of dyes, pigments, and FD&C colorants: azo/benzidine, anthraquinone, perylene, and triarylmethane. Wastes categories include: azo, monoazo, diazo, triazo, polyazo, azoic, pyrazolone and benzidine categories of the azo/benzidine dye and pigment class; the anthraquinone and perylene categories of the anthraquinone dye and pigment class; and the triarylmethane, and triphenylmethane categories of the triarylmethane dye and pigment class.

APPENDIX B

LIST OF EXPANDED SCOPE FACILITIES

Table B-1. List of Expanded Scope Facilities						
Count	Facility Name	Location	Constituent of Concern	Small Business Administration Size	SIC Code(s)	NAICS Code(s)
1	BIDDLE SAWYER	NEW YORK, NY 10121	2,4-Dimethylaniline	Big	5169	42269
2	CHEM SERVICE INC	WEST CHESTER, PA 19381	2,4-Dimethylaniline	Small	2869	325199
3	ALFA AESAR	Ward Hill, MA 01835	2,4-Dimethylaniline	Big	N/A	
4	ADAPTEC	ROCK HILL SC 29730	2,4-Dimethylaniline	Big	5169	42269
5	B I CHEMICALS	MONTVALE, NJ 07645	2,4-Dimethylaniline	Big	5169	42269
6	BAYER		2,4-Dimethylaniline	Big	2836, 2879	325414,32532
7	ENGELHARD CORP	ISELIN, NJ 08830	2,4-Dimethylaniline	Big	2819	331311
8	FIRST CHEMICAL	PASCAGOULA, MS 39568	2,4-Dimethylaniline	Big	2813, 2819, 2865, 2869	32512, 32513, 32511, 32518, 325192
9	HOECHST D		2,4-Dimethylaniline	Big	2865, 2869	32511, 325192
10	LONZA BAYPORT	9700 BAYPORT BLVD. PASADENA, TX 77507	o-Anisidine	Big	2869	32511, 325192
11	CHICAGO SPECIALTIES L.L.C.	735 E. 115TH ST. CHICAGO, IL 60628	p-Cresidine	Big	2865	32511, 325192
12	CINCINNATI SPECIALTIES LLC.	501 MURRAY RD. CINCINNATI, OH 452171014	p-Cresidine	Big	2869	325199
13	MORTON INTL. INC. PATERSON FACILITY	335 MCLEAN BLVD. PATERSON, NJ 07504	p-Cresidine	Big	2865	32511, 325192